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NEW MEXICO AIR QUALITY MAINTENANCE PLAN DEVELOPMENT ASSISTANCE

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DECEMBER 1976

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16. ABSTRACT

In New Mexico, the counties of Bernalillo, Dona Ana, Santa Fe, San Juan, and Chavez were designated as air quality maintenance areas (AQMAs) on June 2, 1975. A requirement under an AQMA designation is for the State to conduct a comprehensive analysis for each area and develop a plan to maintain air quality standards. Engineering Science, Inc., under contract to EPA, assisted New Mexico in conducting the AQMA analyses. The tasks involved reviewing and updating emission data for particulate matter (TSP) and carbon monoxide (CO); forcasting emissions to 1978, 1980, and 1985; applying the APRAC-1A and AQDM models for CO and TSP respectively; and reviewing the AQMA designations. Significant sources contributing to the TSP problem include fugitive dust from unpaved roads, dirt parking lots, and construction activities. Diffusion modeling results for CO were found to represent neither the magnitudes nor temporal distribution of measured CO concentrations. Modeling results for TSP indicate that standards will continue to be violated in Bernalillo and Dona Ana Counties, and that standards will be violated in Santa Fe County by 1985.

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By

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Arcadia, California 91006

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SUMMARY

The evaluation of total suspended particulate matter (TSP) monitoring data, emission inventory development, and dispersion modeling, indicated that the TSP National Ambient Air Quality Standards (NAAQS) are presently being exceeded in Bernalillo and Dona Ana Counties and are nearly exceeded in Santa Fe County. The TSP levels were found to be greatly dependent upon fugitive dust sources such as unpaved roads, dirt parking lots, re-entrained dust from paved roads, construction activities, aggregate storage, and general windblown dust associated with the geography and climatology of New Mexico. Growth forecasts indicated that the major emission source categories would increase approximately 40 percent from 1975 to 1985. These increases in emissions will result in the TSP levels increasing approximately 25 to 35 percent. This increase in TSP levels will result in Bernalillo and Dona Ana Counties continuing to violate the NAAQS while Santa Fe County will gradually approach the NAAQS and probably violate by 1985.

Carbon monoxide levels in Bernalillo, Chavez, Dona Ana, San Juan and Santa Fe Counties were evaluated by data trend analysis, site visits, and dispersion modeling. It was determined that most monitoring sites were located so as to measure peak hour urban concentrations and therefore not be very useful in determining 8-hour impacts on the effect of control strategies to reduce those impacts. Bernalillo County is considered to experience violations of the CO NAAQS at present. The APRAC-1A dispersion model was used to simulate several peak CO periods in Bernalillo County in 1975 and was found to neither represent the magnitudes nor temporal distribution of the measured CO concentrations.

CHAPTER I

INTRODUCTION

The State of New Mexico Implementation Plan was officially submitted to EPA on January 27, 1972. Out of a total of eight AQCR's, four were designated as Priority III for all five primary air contaminants indicating no serious air pollution problem. Four of the AQCR's were designated as Priority I or IA for TSP: Albuquerque, Las Cruces, Four Corners, and the Arizona-New Mexico Southern Border Interstate AQCR. At that time, only the Las Cruces AQCR was designated as Priority I for CO. Since the SIP was submitted, additional air monitoring has been conducted and certain of the point sources have been brought into compliance. Because of these and other changes, the AQMA designations for the State of New Mexico were promulgated as follows:

AQMA	Area	Pollutants
Albuquerque	Bernalillo County	CO, TSP
Las Cruces	Dona Ana County	CO, TSP
Santa Fe	Santa Fe County	CO, TSP
Four Corners	San Juan County	CO
Roswell	Chavez County	CO

EPA has developed guidelines which could be used by the States in analyzing their particular problems and the types of control strategies required to maintain compliance with the National standards. The latest time schedule which has been voiced by EPA is to have the States conduct analyses of their problems, make projections of growth rates from 1975 to 1985, and to project with appropriate models the air quality levels that will occur between 1975 and 1985 unless control measures are instituted.

Engineering-Science, Inc. (ES) under contract to the U.S. Environmental Protection Agency, Region VI, assisted in the analysis phase of the air quality maintenance program. The ES assistance included:

1. Review and Update of Emission Data. ES assembled, reviewed, and updated 1975 area and point source particulate matter inventories for the three TSP AQMA's and stationary and mobile source CO emission inventories for the five AQMA's.

2. Forecast 1978, 1980, and 1985 Emissions. The base-year emissions data for the five AQMA's were used with OBERS projections to estimate future emission trends.

3. Diffusion Modeling. The APRAC-1A Urban Diffusion Model was used to estimate the CO concentration and the Air Quality Display Model was used to estimate the TSP concentrations for 1975, 1978, 1980, and 1985.

4. Review AQMA Designations. The five AQMA designations were reviewed to determine the effect of fugitive emissions or other site related emissions that might have affected the air quality data used to designate the AQMA's.

Throughout the project, wherever possible and to the degree possible, ES followed the guidelines contained in EPA documents and publications. In particular, ES relied on the methodologies contained in the following:

- Compilation of Air Pollution Emission Factors - AP42.
- Guide for Compiling a Comprehensive Emission Inventory - APTD 1135.
- Guidelines for Air Quality Maintenance, Planning and Analysis - Volumes 1, 7, 11, 12, and 13.
- User's Manual for the APRAC-1A Urban Diffusion Model Computer Program.
- Air Quality Display Model User's Manual.
- Guidance for Air Quality Monitoring Network Design and Instrument Siting.
- 40 CFR 51. Maintenance of National Ambient Air Quality Standards.

The methodologies used in this assistance program are discussed in Chapter II. The air quality evaluations for 1975, 1978, 1980, and 1985 are given in Chapter III for total suspended particulate matter and in Chapter IV for carbon monoxide during 1975. Chapter V discusses the conclusion derived from the evaluations.

CHAPTER II

METHODOLOGY

GENERAL

This chapter discusses the general methodology used to update the complete emissions inventory for particulate matter and carbon monoxide for 1975; the forecasting of the emissions for the years 1978, 1980, and 1985; and will also review the dispersion models and their application procedures. A complete emission inventory listing is included in the Appendix and data cards were given to the New Mexico Environmental Improvement Agency.

EXISTING EMISSION INVENTORY - 1975

The general procedures used in updating the emission inventory for particulate matter and carbon monoxide followed those described in APTD 1135, Guide for Compiling a Comprehensive Emission Inventory. The existing emissions data files of the USEPA, Region VI, the New Mexico Environmental Improvement Agency (EIA), and the Albuquerque Department of Environmental Health (ADEH) were reviewed to obtain historic emission data. These data were generally limited to the years 1970, 1971, 1972, or 1973. Other major sources of data included the New Mexico State Highway Department and the Middle Rio Grande Council of Governments of New Mexico. No emission testing or other field measurements were conducted by Engineering-Science.

Point Sources

The point source emission update was accomplished by reviewing the EPA, EIA and ADEH files to obtain past emission inventories and a list of the significant point sources. No set emission rate cut-off limit was followed for developing the list. However, all point sources that had the potential to emit more than twenty-five tons per year or five tons per month were included in the list. A list was developed for particulate matter and carbon monoxide for Bernalillo, Santa Fe, and Dona Ana Counties and a list for only stationary carbon monoxide sources was developed for Chaves and San Juan Counties. A letter was mailed to each source in Santa Fe, San Juan, Dona Ana and Chaves Counties by the EIA while letters sent to sources in Bernalillo County were mailed by ADEH. These letters contained standard emission data forms used by each of the two agencies. The point sources were requested to follow their past records and to update the forms for the calendar year 1975. ES obtained copies of the completed forms from the agencies.

ES, with technical support from EIA and ADEH, calculated the annual average emission estimates for each stationary source. Stack emission testing results were used when possible to estimate emissions, however, the majority of emission estimates were calculated from production figures in conjunction with AP42, Compilation of Air Pollution Emission Factors. The specific emission calculation procedure was noted on each emission data form and the forms were returned to the EIA and ADEH main files.

Area Sources

The area source emission inventory was developed in three counties: Bernalillo, Dona Ana and Santa Fe. Past area source emission inventories developed by the EIA and ADEH were reviewed. A comprehensive area source emission inventory had been prepared for Bernalillo County by ADEH for the past several years. It was apparent from the past inventories that particulate emissions from transportation related sources (i.e., paved roads, unpaved roads and tires and exhaust) far exceeded any other category. Other documents developed by EIA suggested that windblown dust from natural causes were also important. The following particulate area source categories were selected and completed for each county:

- Unpaved Roads
- Paved Road Re-entrained Dust
- Tire and Exhaust
- Wind-Blown Dust from Natural Causes
- Residential/Commercial/Institutional Fuel Usage
- Aggregate Storage
- Construction
- Aircraft Activity

The unpaved road emission estimates were calculated using AP42. The data required include:

- Vehicle Miles Traveled (VMT)
- Vehicle Speed
- Silt Content of Road Surface Material
- Dust Repression Program Efficiency
- Number of Rainy Days

Very little information was available that was specific to each county or sub-county area. The VMT estimate was calculated by obtaining the miles of unpaved roads in each county from "1973-74 Highway Statistics and Related Information", a report prepared by the New Mexico State Highway Department. The miles of unpaved roads were then multiplied by an estimated average daily traffic (ADT) obtained from "Investigation of Fugitive Dust", EPA-450/3-74-036a, June, 1974. The estimated ADT's were assumed to be as follows:

Type of Road	Urban ADT	Rural ADT
Primitive	5	2
Unimproved	25	20
Graded or Drained	75	40
Rock or Gravel	100	60

The total county emissions were calculated by type of road by assuming a silt content of 20 percent (from soil conservation maps), an average speed of 35 mph (16m/sec)(as an upper limit), and by obtaining the number of days with 0.01 inches (0.25cm) or more of rainfall. The counties were then divided into sub-county grids and the total miles of each road type was calculated from New Mexico State Highway Department road maps. The county total emissions were then allocated to each grid based on the percentage of primitive, unimproved, graded or drained, and rock or gravel roads that was calculated for each grid.

The re-entrained dust emissions from paved roads were estimated as suggested in a draft report, "Quantification of Dust Entrainment from Paved Roads," prepared for the EPA, Office of Air Quality Planning and

Standards, dated March 31, 1976. The emission factor assumed for all counties was 6.1 grams per vehicle mile traveled as an average of all land use categories. The New Mexico State Highway Department Average Daily Traffic Flow maps for 1974 corrected for 1975 growth were used to select sub-county area grids and to apportion the percentage of total county VMT's to each grid. The total county paved road emissions were calculated and then allocated to each grid based on the percentage of the total VMT within each grid. Total county VMT's were obtained from the New Mexico State Highway Department.

The tire and exhaust particulate matter emissions were calculated as suggested in AP42, Table 3.1.2-13, and allocated to sub-county grids as were the re-entrained dust emissions from paved roads.

The wind-blown dust from natural causes were estimated based on equations suggested for agricultural tilling in "Development of Emission Factors for Fugitive Dust Sources", EPA-450/3-74-037, June, 1974. The emissions were calculated by using the following equation:

$$E = aIKCLV$$

Where:

E = suspended particulate fraction of wind erosion losses of (open) tilled fields, tons/acre/year

a = portion of total wind erosion losses that would be measured as suspended particulate, estimated to be 0.025.

I = soil erodibility, tons/acre/year

K = surface roughness factor, dimensionless (in these calculations ES used 0.75).

C = climatic factor, dimensionless (calculated in percent)

L = unsheltered field width factor, dimensionless. (ES used 1.0).

V = vegetative cover factor, dimensionless

The soil maps obtained from the USDA Soil Conservation Service are delineated by soil associations (grouping similar soil classes into one general classification). The appropriate "I" value for each soil association was computed by the weighted percent of each soil class within that soil association.

The K Factor, surface roughness, accounts for the roughness of soil surface in resisting soil erosion. For open desert, 0.75 was used. The C Factor, climatic, is a measure of climatic conditions affecting soil erosion. ES used the climatic factor for New Mexico as determined by the USDA Soil Conservation Service. For the emission grid system used in this study, the L Factor, field length, was assumed to be equal to one. Some soil associations within emission grids may not require an assumption of less than or equal to one because of topographical features that would restrict wind flow. However, the assumption is thought to be adequate for the large emission grids that were selected. The V Factor, vegetation cover, is a measure of the sheltering effect of the vegetation in reducing soil erosion. It was computed by knowing IKCL and the estimated dry grain crop residue equivalent for the vegetation for each soil associate which was furnished by the USDA. The factor was in the range of 0 to 1.0. If large amounts of vegetation were on the soil association, then a small V Factor would be calculated.

Sub-county grids were assigned to each county. The above equation was then used to calculate the wind-blown emissions from each sub-county grid based on the soil association and vegetation in each grid. Both annual average and seasonal emissions were calculated for each country.

Emissions from Residential/Commercial/Institutional fuel usage were developed for Bernalillo County using 1975 natural gas consumption data available through the ADEH, and applying AP42 emission factors. Emissions were gridded on an estimated population distribution within the City of Albuquerque with the assumption that a negligible amount of natural gas was used outside the city limits. A comparatively small emission estimate was developed for fuel use in Bernalillo County outside of Albuquerque using propane consumption data obtained from propane suppliers and apportioning according to estimated population concentrations. Emissions from wood burning in fireplaces were estimated from a study of source tests entitled, "Particulate, Carbon Monoxide and Hydrocarbon Emissions from Residential Fireplaces", Albuquerque Department of Environmental Health, Air Quality Source Testing Report No. 74-1, February 25, 1974.

Emissions were apportioned on the same population grid used for natural gas usage.

Emissions from fuel usage were not calculated for Santa Fe and Dona Ana counties due to the relatively low contribution of this source category in Bernalillo County and because data were not readily available within the study period.

Aggregate storage emissions were developed assuming that point sources such as asphalt batch plants, ready-mix concrete plants, and gravel crushers all had adjacent aggregate storage piles. Emission factors were taken from AP42 and an EPA study entitled, "Report on Fugitive Dust", EPA 450/3-74-037. The basic emission factors were .33 #/ton of material placed in storage or 10.4 #/acre/day, which were to be corrected for climatological influence through Thornthwaite's precipitation-evaporation index (PE). The PE for Bernalillo County from the PE map is 35, for Dona Ana County 19, and for Santa Fe County 46. The equation in tons of particulate is:

$$E = \frac{.33\ (\text{tons material placed in storage})}{\frac{(PE)^2}{100}}$$

Because information on the size of the storage piles was not available, an attempt was made to relate the amount in storage at any given time to the annual throughput of the particulate operation. Several telephone calls to source operators indicated that an aggregate pile equivalent to 20% of annual throughput, the latter figure available from the point source inventory, may be a rough approximation. Aggregate storage emissions for particulates were calculated for all three counties.

Emissions from construction activity were calculated for Bernalillo County from permits issued by the ADEH for earth-moving activity and from AP42. The AP42 emission factor of 1.2 tons of particulate per acre for every month of construction activity appears to be associated primarily with grading, excavation, and blasting, and to a lesser degree on structural work. The application of the factor required assumptions of the months and number of acres actually under continued use for the large projects. On a large project, such as a housing sub-division, only a small portion of the total acreage would be subjected to earth-moving at a given time. Emissions from construction activity were not calculated for Santa Fe and Dona Ana Counties because little specific construction information was available.

Aircraft emissions were developed for Bernalillo County but not for Dona Ana and Santa Fe Counties due to the relatively low air traffic volume in these counties. Landing/take-off (LTO) numbers were obtained from the FAA with the aid of the ADEH for the Albuquerque Municipal Airport and for Kirtland Air Force Base. AP42 emission factors were applied to the LTO's.

Emissions from refuse burning were calculated for Bernalillo County for the area outside of the Albuquerque city limits. The ADEH information indicated that essentially no refuse was burned in the city but that 90% of the residents outside the city had no refuse pick-up. ADEH information indicated that approximately 0.3 T/year/person was burned in the county outside of the city. This refuse generation rate is lower than the 0.82 T/person/year indicated in AP42, but this latter figure includes commercial and industrial refuse averaged on a per person basis. The emissions calculated were allocated according to population with approximately one-half in the county south of the city limits along the Rio Grande, and one-half in the area east of Albuquerque.

Incinerator emission data were available from the 1974 ADEH Emission Inventory and were adjusted to 1975 emissions by subtracting the discontinued emissions from incinerators shut down as of the first of 1975. The ADEH supplied the number of discontinued incinerators. Emissions for 1975 from refuse burning were not estimated for Dona Ana and Santa Fe Counties in this study. Previous calculations made by the New Mexico EIA showed that refuse burning emissions are very small in those two counties.

Line Sources

The line source carbon monoxide emission inventory was developed for each of the five counties as described in the User's Manual for the APRAC-1A Urban Diffusion Model Computer Program, September, 1972 and AP42. The model and its application will be described in detail in the next section. All data for the line source emission inventory relating to average daily traffic, average speeds, vehicle and total county VMT's were obtained from the New Mexico State Highway Department (SHD) and the Middle Rio Grande Council of Governments of New Mexico (COG). Link-node maps were available that established a coordinate system for all major roads in each county except Santa Fe County. Traffic flow maps were also obtained for each county for 1974 and were corrected for growth to represent the 1975 base year. SHD county highway maps were used to supplement the other maps as was the report "1973-74 Highway Statistics and Related Information". These basic sources of information were used to develop the necessary traffic link data that included: X and Y coordinates for beginning and ending points for each major road link; average daily traffic along each link; average speed along each link; and the length of each link.

The APRAC-1A determines the emission rate by the equation:

$$E = aS^{-B}$$

Where E = emission rate, g-CO per VMT

S = vehicle speed (mph)

a and B are constants

To be more consistent with AP42, the emission rates were determined for 1975 in Bernalillo County by using the methodologies suggested in AP42. These estimates were calculated with technical support by the Albuquerque Department of Environmental Health (ADEH). The annual emission factor for the 1975 vehicle mix in Bernalillo County was calculated in Technical Report No. 64, "1975 Vehicle-Miles/Kilometers and Hours of Travel and Air Pollutant Emission in the Greater Albuquerque Area", April, 1976, prepared by the COG. The emission factor estimates were given for different types of streets and associated vehicle mix and speeds. The values for a and B in the APRAC-1A emission equation were selected to give equal emission rate values to those reported by COG. The annual average equation was calculated to be:

$$E = 156\ S^{-0.021}\ \text{g/VMT}$$

The link-node emission sources accounted for approximately 70% of all VMT's within each county. The remaining VMT's were allocated to sub-county grids as required by the APRAC-1A.

1978, 1980, 1985 EMISSION FORECASTING

Future emissions (1978, 1980, 1985) from point and area sources were projected as per the Guidelines for Air Quality Maintenance, Planning and Analysis in the following way:

1. 1975 base-year activity emissions for point and area sources (paved roads, unpaved roads, tire and exhaust, aggregate areas) were determined.
2. Base-year emissions were scaled by a dimensionless growth factor developed for each projection year to determine future emission levels. Procedures for developing growth factors are discussed below.
3. Future emissions were computed by multiplying base-year emissions by the appropriate growth factors.

For each projection year, growth factors for 13 NER process categories from OBERS industrial growth projections were calculated for each AQCR in New Mexico. The growth factors, as derived from OBERS projections specific for New Mexico, are intended to reflect the change in industrial output for each process from the base-year to the projection years.

These AQCR projections are an extension of the OBERS(1) program which has produced historical and projected measures of economic inactivity for the nation and its sub-areas. The measures produced include personal income, population, per capita income, employment, and earnings.

(1) The OBERS program is a joint undertaking of the Bureau of Economic Analyses (BEA) of the Department of Commerce and the Economic Research Service (ERS) of the Department of Agriculture. This program acquired the acronym of OBERS in the mid 1960's at which time BEA was named the Office of Business Economics (OBE) and is a combination of OBE-ERS.

The AQCR projections were prepared by ES by disaggregating the economic projections prepared under OBERS' program into the geographic detail necessary to reaggregate them into AQCR's. Projections of income and employment were prepared for eight individual industrial classes in each AQCR (i.e., Mid-Rio Grande Interstate AQCR - Albuquerque, Santa Fe AQMA, Las Cruces AQCR).

Various methods were used to make the projections, depending upon the individual industry's role in each area's economy. However, the methods used insure that in each of the eight areas, the projected income and employment constitute an economy with an internally balanced structure. Because the projections were prepared in industrial detail they reflect the effects of variations in growth rates among individual industries, which makes it possible for the projected overall economic path of an area to depart substantially from its past trend. The eight industrial areas for which projections were determined were mining, construction, manufacturing, T.C.U. (transportation, communication, utilities), trade, F.I.R.E. (finance, insurance, and real estate), services and government.

The eight industrial source categories and associated growth projection factors are depicted in Tables II-1 through II-3 for the three AQMA study areas.

Growth projections for Bernalillo County shows a substantial increase from 1975 through 1985 for the eight industrial source categories. There was an average growth increase of 11 percent in 1978, 20 percent in 1980, and 40 percent in 1985 over 1975 base-year estimates. These projections were generally evenly distributed for all the industrial source categories, although the largest increase resulted from home fireplaces which showed the greatest projected increase. Emissions from automobiles and other transportation sources (paved roads, unpaved roads, tire and exhaust) were projected to increase by 42 percent by 1985.

Projections for Dona Ana County showed increases over 1975 but to a lesser degree than experienced in Bernalillo County. There was a 11 percent increase in all source categories in 1978, a 16-22 percent increase in 1980, and a 35-45 percent increase in 1985. Construction related growth activity showed the greatest percentage increase for all years. Transportation sources were projected to increase by 35 percent in the year 1985; thus, emissions from paved roads, unpaved roads, and tire and exhaust would increase by this factor.

TABLE II-1

GROWTH FACTORS FOR BERNALILLO COUNTY

SOURCE CATEGORIES	1975	1978	1980	1985
Point Sources:				
Utilities	1.0	1.1149	1.1915	1.4194
Manufacturing	1.0	1.117	1.1915	1.4319
Construction	1.0	1.1311	1.2185	1.4874
Area Sources:				
Fuel Combustion Nat. Gas	1.0	1.1149	1.1915	1.4194
Fireplaces	1.0	1.1748	1.2914	1.5946
Incinerators & Misc.	1.0	1.117	1.1915	1.4319
Aircraft	1.0	1.1149	1.1915	1.4194
Construction	1.0	1.1311	1.2185	1.4874
Tire and Exhaust	1.0	1.1149	1.1915	1.4194
Manufacturing	1.0	1.117	1.1915	1.4319
Fugitive Sources:				
Wind-Blown Dust	1.0	1.0	1.0	1.0
Paved Road	1.0	1.1149	1.1915	1.4194
Un-Paved Roads	1.0	1.1149	1.1915	1.4194

TABLE II-2

GROWTH FACTORS FOR DONA ANA COUNTY

SOURCE CATEGORIES	1975	1978	1980	1985
Point Sources:				
Manufacturing	1.0	1.1157	1.1928	1.4048
Construction	1.0	1.1336	1.2277	1.453
Area Sources:				
Tire and Exhaust	1.0	1.1002	1.1677	1.3523
Fugitive Sources:				
Paved Roads	1.0	1.1002	1.1677	1.3523
Un-Paved Roads	1.0	1.1002	1.1677	1.3523

TABLE II-3

GROWTH FACTOR FOR SANTA FE COUNTY

SOURCE CATEGORIES	1975	1978	1980	1985
Point Sources:				
Manufacturing	1.0	1.12	1.20	1.475
Construction (includes area sources)	1.0	1.144	1.24	1.5029
Area Sources:				
Tire and Exhaust	1.0	1.1341	1.2235	1.4588
Manufacturing	1.0	1.12	1.2	1.475
Construction	1.0	1.144	1.24	1.5029
Fugitive Sources:				
Wind-Blown Dust	1.0	1.0	1.0	1.0
Paved Roads	1.0	1.1341	1.2235	1.4588
Un-Paved Roads	1.0	1.1341	1.2235	1.4588

Industrial sources in Santa Fe County were projected to grow between 45-50 percent by 1985. The largest percentage increase was associated with increased construction activity. Transportation sources were predicted to grow the least; however, the percentage increase represented significant increase over the base-year.

The only source category of interest in this study for San Juan and Chaves Counties is transportation since carbon monoxide is the only pollutant that the AQMA designation was based upon. Table II-4 lists the growth factors for those counties through 1985.

TABLE II-4

GROWTH FACTORS FOR TRANSPORTATION RELATED SOURCES IN SAN JUAN AND CHAVES COUNTIES

County	Transportation Related Growth Factor			
	1975	1978	1980	1985
Chaves	1.0000	1.1207	1.2012	1.3924
San Juan	1.0000	1.1138	1.1896	1.4101

DISPERSION MODELS

The dispersion models used in this study were the Air Quality Display Model (AQDM) and the APRAC-1A Urban Diffusion Model (APRAC-1A). The AQDM was used to estimate the total suspended particulate matter concentrations and the APRAC-1A was used to estimate the carbon monoxide concentrations. A brief discussion of each model is presented here; however, the user's manual for each should be used to supplement the information in this report.

The Air Quality Display Model (AQDM)

The AQDM was utilized for the estimation of the annual ground-level spatial distribution of pollutant concentrations. The AQDM was developed by the USEPA and is an approved technique for computing annual average ground-level concentrations of gaseous and suspended particulate matter pollutants. The AQDM uses the Pasquill-Gifford diffusion equation and Holland's plume rise equation to simulate plume behavior. Using an annual average emission inventory, actual stack data and annual average meteorological data, ground-level concentrations are calculated both at assigned receptor points and at points comprising a receptor grid network. The model may be used to forecast future ambient air quality for any annual period, once calibrated, by adjusting the input data to correspond to the time period of interest. Larsen's statistical model was utilized in order to compare directly the estimations of the AQDM with the 24-hour National Ambient Air Quality Standards (NAAQS).

The AQDM was calibrated for Bernalillo County as will be discussed in the following chapter and that calibration was assumed to be representative of Santa Fe and Dona Ana Counties. No calibration was possible in Santa Fe and Dona Ana Counties since the necessary meteorological data were unavailable for 1975. Future air quality was estimated for each county by using a five-year summary of meteorological data and the forecasted emissions as discussed previously.

The Urban Diffusion Model (APRAC-1A)

The APRAC-1A diffusion model was developed as a model for computing the carbon monoxide concentrations at any point within an urban area. The model calculates the CO contributed by the following means:

Synoptic Model: calculates hourly CO concentrations as a function of time, for comparison and verification with observed concentrations;

Climatological Model: calculates the frequency distribution of 10 concentrations;

Grid-Point Model: calculates CO concentrations for a one-hour period over a geographical grid system.

As specified by EPA, the synoptic model was used for all calculations in this study. CO data collected in 1975 were used in the verification procedure. A detailed explanation of the verification procedure will be discussed in the following chapters.

The input to APRAC-1A consists of run identification information, source and receptor data, grid specifications, meteorological data, and program option specifications.

CHAPTER III

TOTAL SUSPENDED PARTICULATE CONCENTRATIONS IN BERNALILLO, DONA ANA, AND SANTA FE COUNTIES

GENERAL

The purpose of this chapter is to discuss the total suspended particulate (TSP) evaluation in the three counties designated as AQMA's for TSP. The study included: the development of 1975, 1978, 1980, and 1985 point, area and line source emission inventories as discussed in Chapter II; a site evaluation of each monitor; a trend analysis of the 1975 TSP data; a validation attempt for the Air Quality Display Model (AQDM); a validation and/or data correction procedure developed for emission models in Bernalillo County; and the application of the AQDM to estimate present and future air quality.

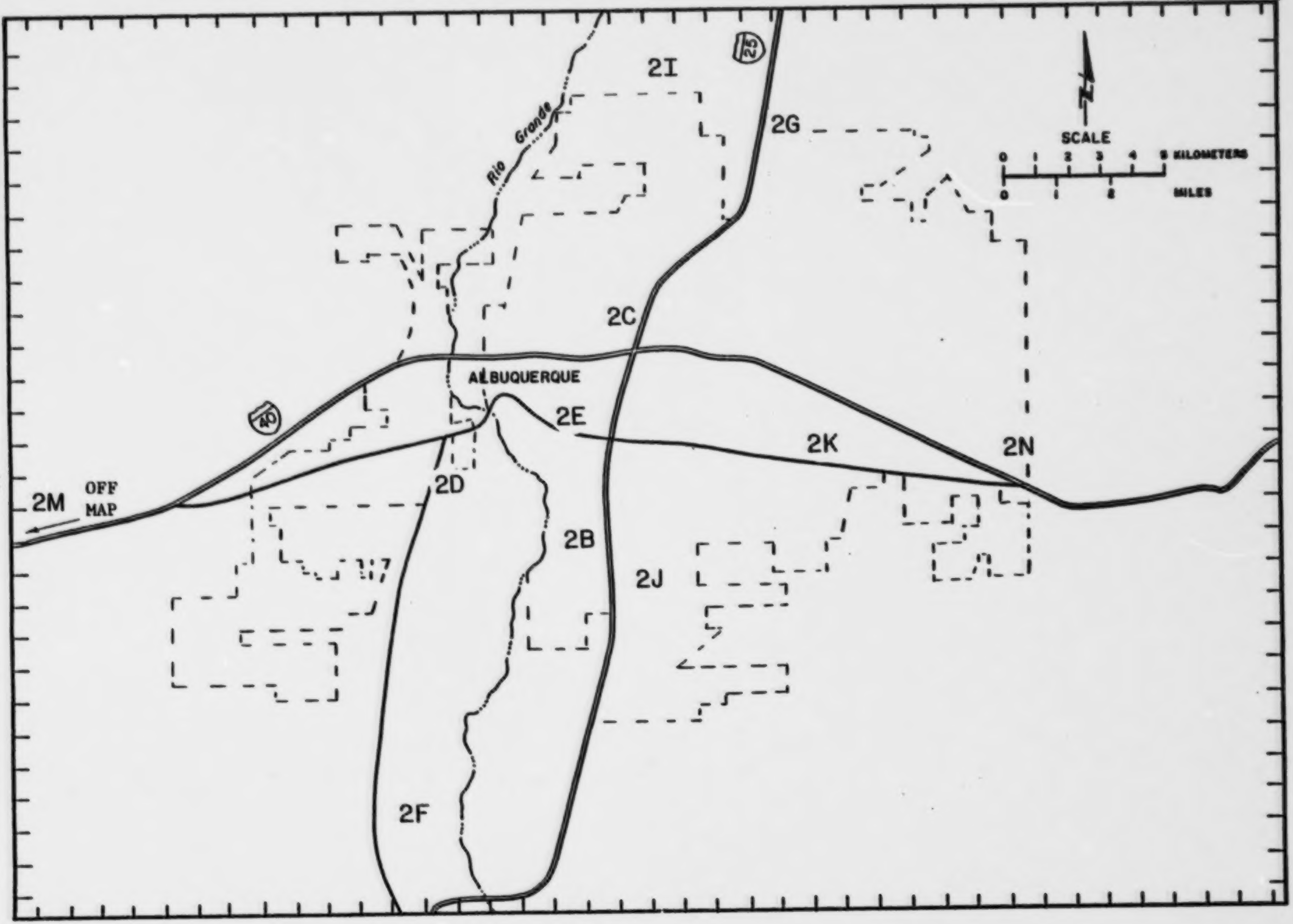
The data base necessary for calibration/validation of the AQDM requires several monitoring sites with valid annual average data, an updated emissions inventory and detailed meteorological information. Only Bernalillo County had the required data base to attempt the validation. Bernalillo County also recorded the highest TSP values in New Mexico. For this reason, the majority of effort was focused in Bernalillo County with the intent of applying the calibration factor to the other two counties. The following sections will discuss the calibration/validation attempt of the AQDM in Bernalillo County and the present and future air quality in each county.

BERNALILLO COUNTY

There were eleven high volume samplers in operation during 1975 in Bernalillo County. These sites were located both in urban and rural areas. Figure III-1 shows the general location of each monitoring site.

A sample was taken at each site on a one every sixth day schedule. However, no monitor took data on every scheduled day. Stations 2I and 2C obtained 54 samples during the year while Station 2K only obtained 20 samples. Approximately 68 percent of the scheduled sampling days were actually sampled. That is, on the average, the 365 days during

FIGURE III-1 LOCATION OF TSP MONITORS, BERNALILLO COUNTY


2I
25
2G
N
SCALE
0 1 2 3 4 5 KILOMETERS
0 1 2 MILES
Rio Grande
2C
ALBUQUERQUE
40
2E
2K
2N
OFF MAP
2M
2D
2B
2J
2F

1975 had to be represented by only 41 samples. However, upon analysis of the data taken in the other counties, Bernalillo was the only county with sufficient data to conduct a model validation effort.

The trend analysis of TSP levels was conducted to determine the distribution by season and location. Figure III-2 shows the monthly average TSP levels for the two highest and the two lowest monitoring sites. Site 2F is located at Polk Junior High School; 2C is located near Candelaria Road and Edith; 2N is located in a NE subdivision; and 2M is located at an old radar site several miles west of Albuquerque. Figure III-3 is similar to Figure III-2, except that the maximum value measured during the month is plotted rather than the monthly average. As shown, November stands out as the "worst-case" month for most sites. As will be shown in Chapter IV, the highest values for CO were also reported during November.

Also shown at the tops of Figures III-2 and III-3 is a plot of the historical climatic factor for each month. The higher the climatic factor (see Chapter II) the more potential for wind-blown fugitive dust. Little correlation can be seen between the historical climatic factor and TSP levels.

Figure III-4 shows the highest TSP recorded for each month in 1975 for all stations. April, November, and December experienced TSP levels above the standard at one or more stations.

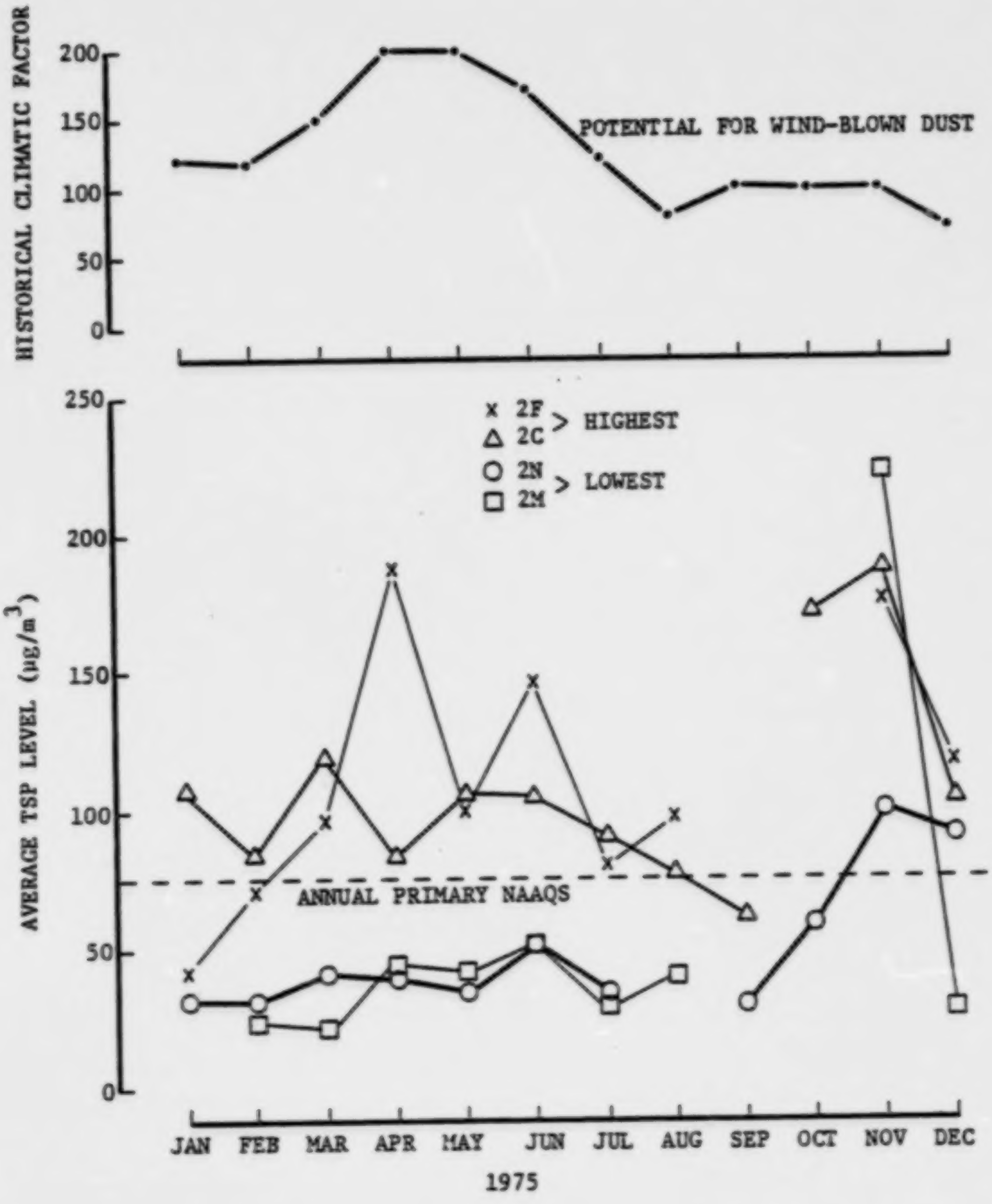
The general spatial distribution of the annual geometric mean TSP levels is presented in Figure III-5. The distribution indicates that the average TSP levels tend to increase rapidly as the population density in the area increases. However, a similar plot of the 24-hour maximum observed levels indicates that man's activity has little if any influence. As mentioned above, Station 2M measured one of the lowest annual averages but also measured the highest 24-hour concentration.

Figures III-6 through III-16 show the log-probability plots for each TSP site. The solid lines represent continuous "log-normal" distribution and the circle shows the maximum 24-hour level expected to occur once per year at that station based on a log-normal distribution. Most of the sites tend to fit a log-normal distribution very well.

FIGURE III-2

ARITHMETIC AVERAGE TSP CONCENTRATION ($\mu g/m^3$) BY MONTH

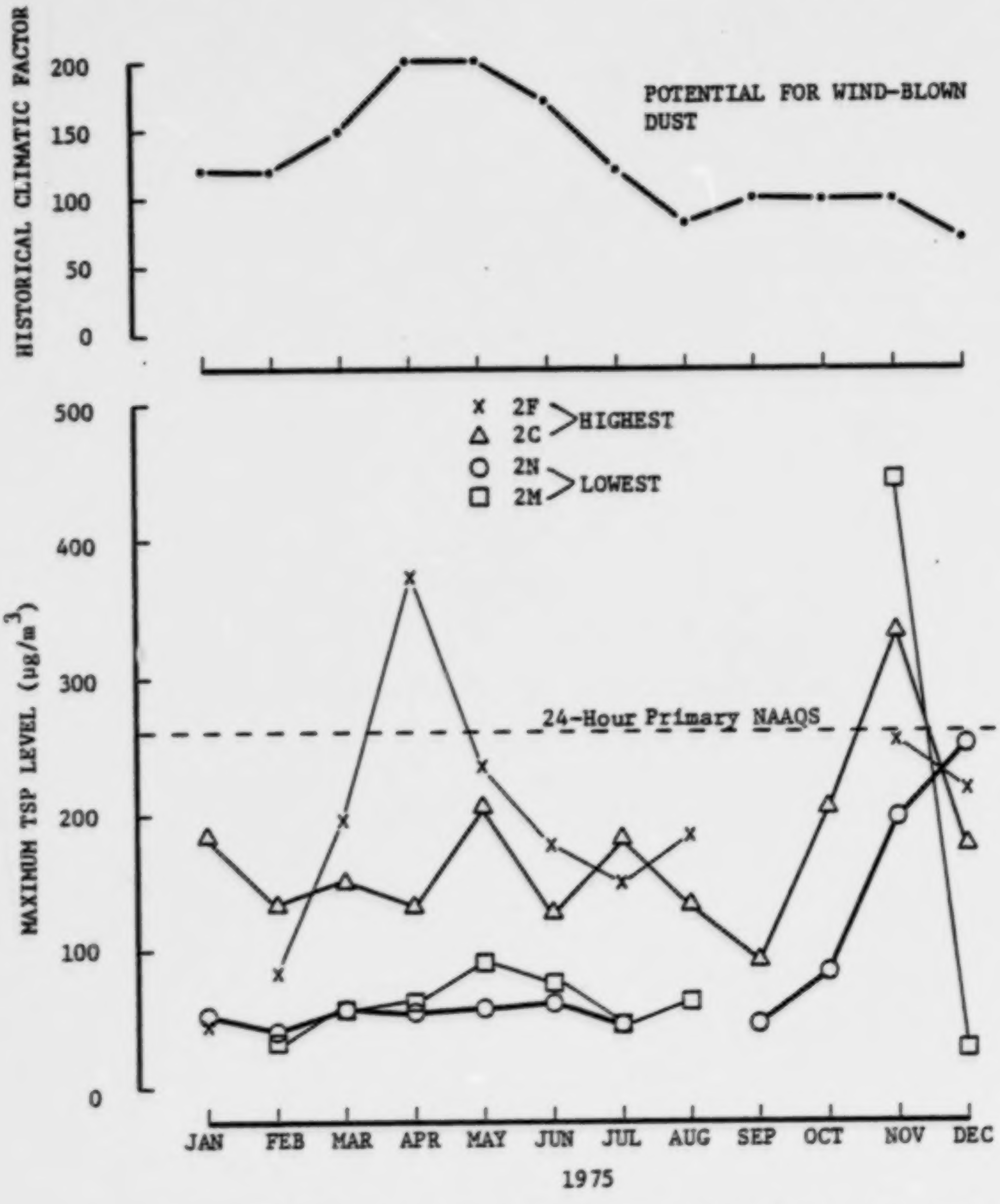
BERNALILLO COUNTY, 1975



NOTE: STATIONS NO. 2F and 2C RECORDED THE HIGHEST TSP LEVELS WHILE STATIONS NO. 2N and 2M RECORDED THE LOWEST TSP LEVELS.

FIGURE III-3

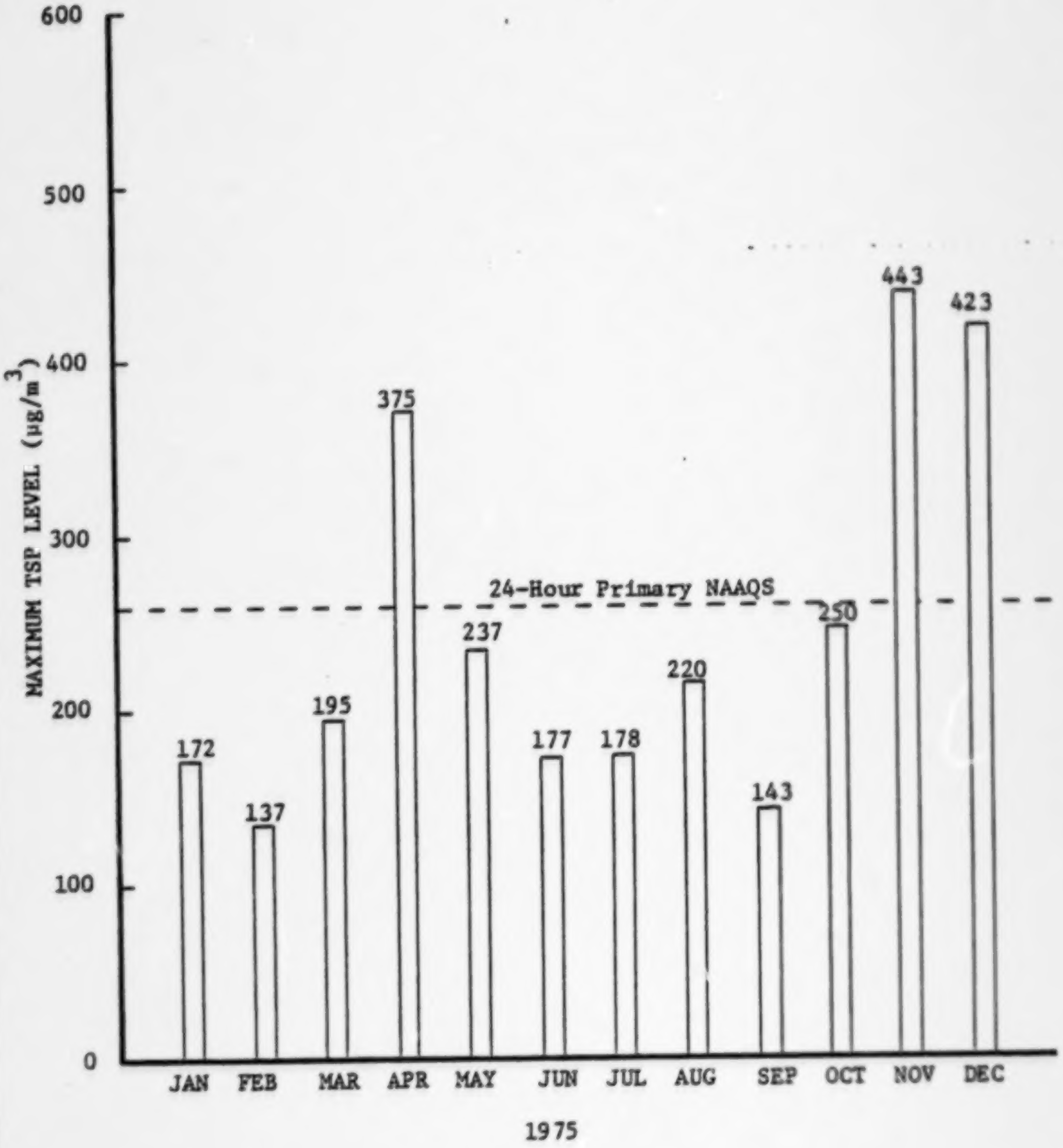
MAXIMUM 24-HOUR TSP CONCENTRATION ($\mu g/m^3$) BY MONTH, BERNALILLO COUNTY, 1975

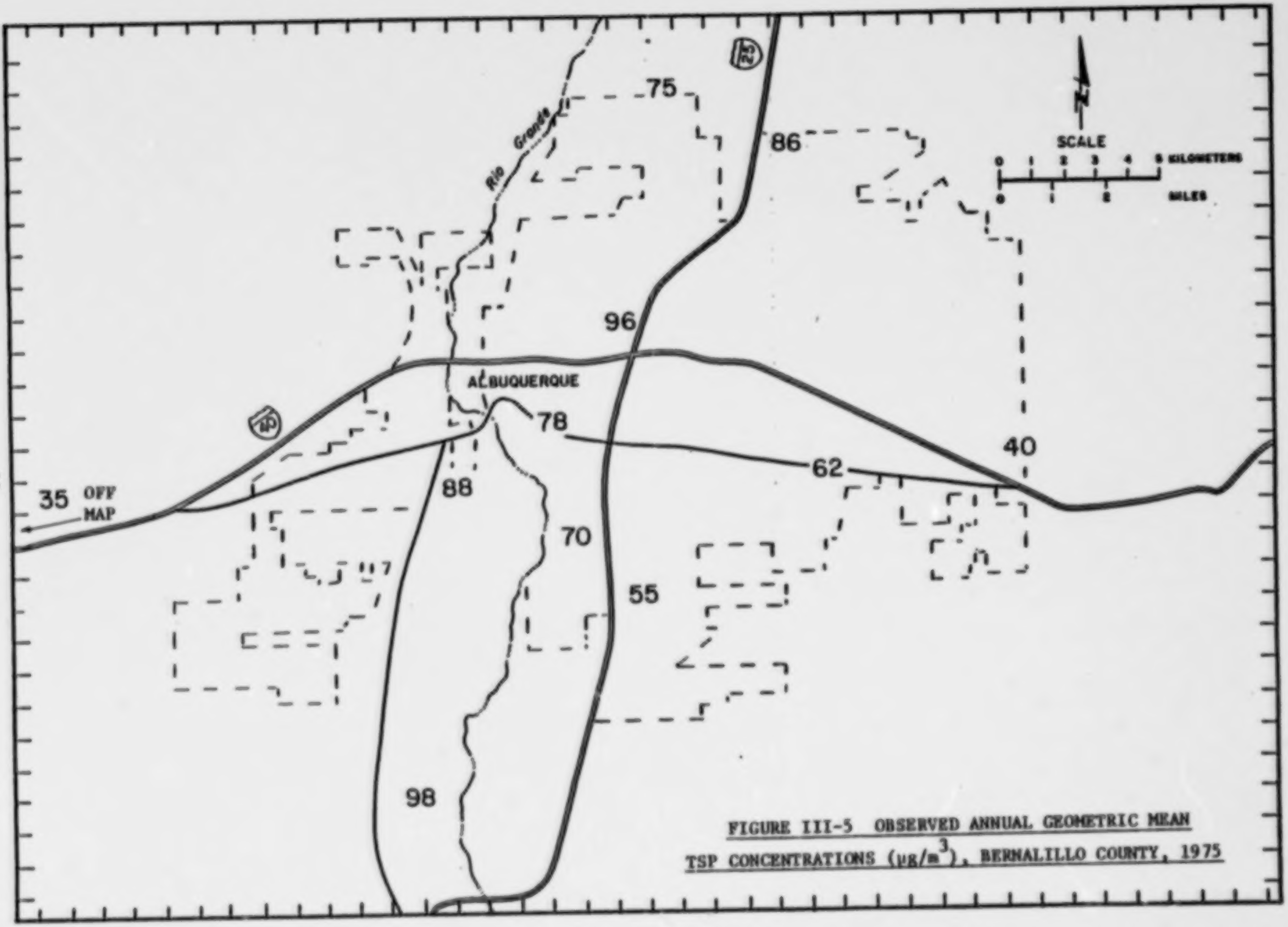


NOTE: STATIONS NO. 2F AND 2C RECORDED THE HIGHEST TSP LEVELS WHILE STATIONS NO. 2N AND 2M RECORDED THE LOWEST TSP LEVELS.

FIGURE III-4

MAXIMUM OBSERVED 24-HOUR TSP CONCENTRATION ($\mu g/m^3$) BY MONTH, BERNALILLO COUNTY, 1975





SCALE
0 1 2 3 4 5 KILOMETERS
0 1 2 MILES
N
Rio Grande
25
40
75
86
96
ALBUQUERQUE
78
40
62
35 OFF MAP
88
70
55
98

FIGURE III-5 OBSERVED ANNUAL GEOMETRIC MEAN TSP CONCENTRATIONS ($\mu g/m^3$), BERNALILLO COUNTY, 1975

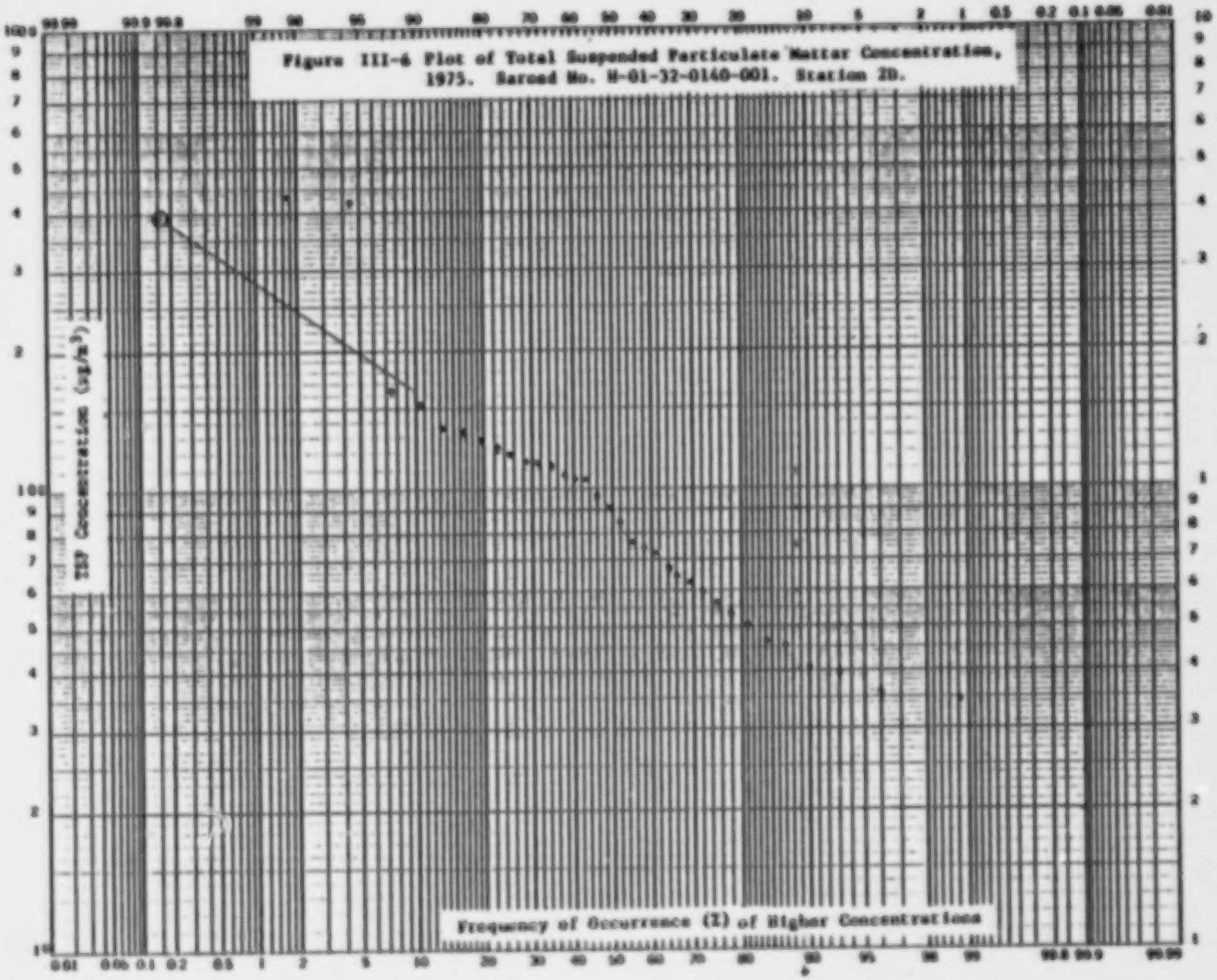


Figure III-6 Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. H-01-32-0140-001. Station 2D.

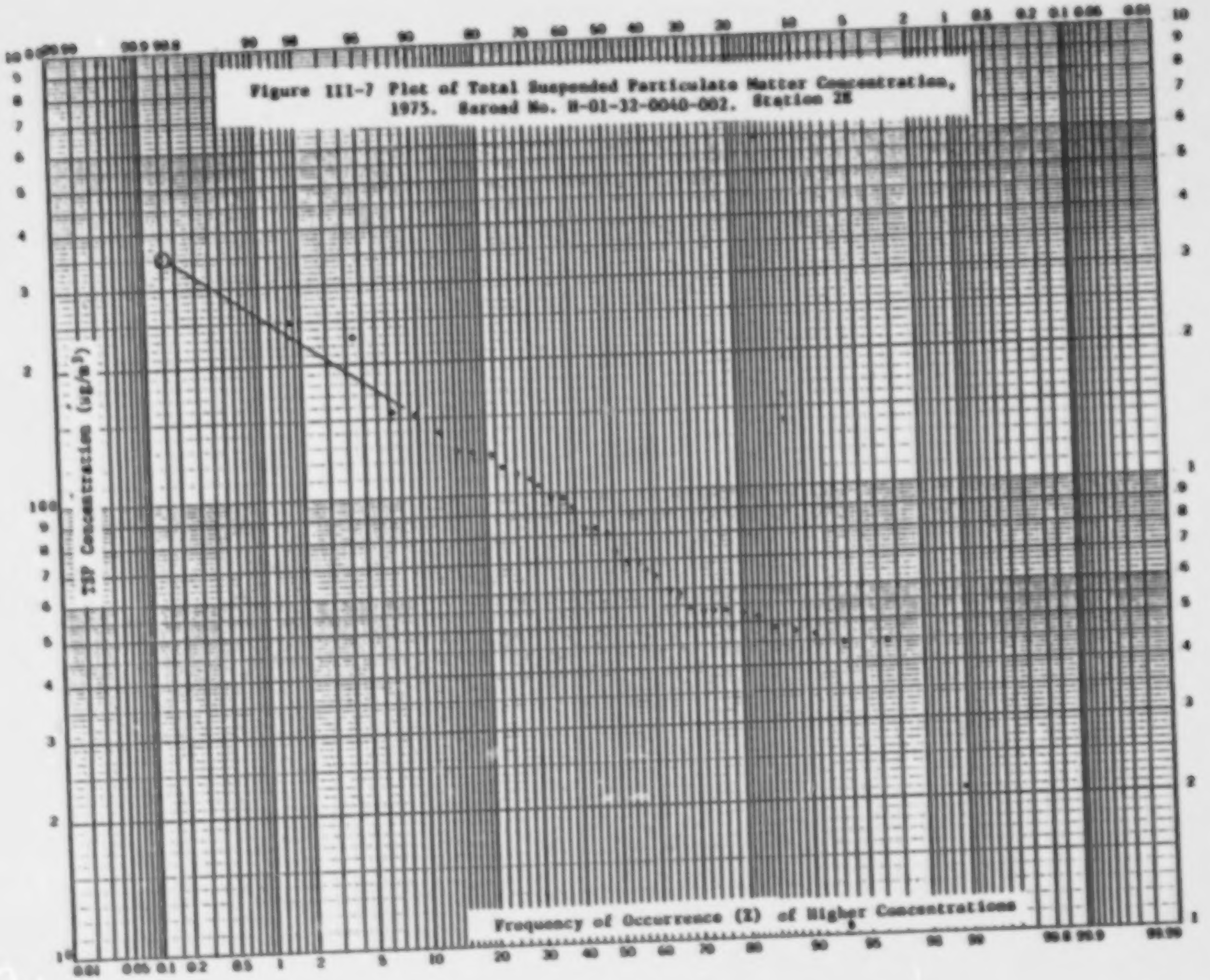


Figure III-7 Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. H-01-32-0040-002. Station 2E

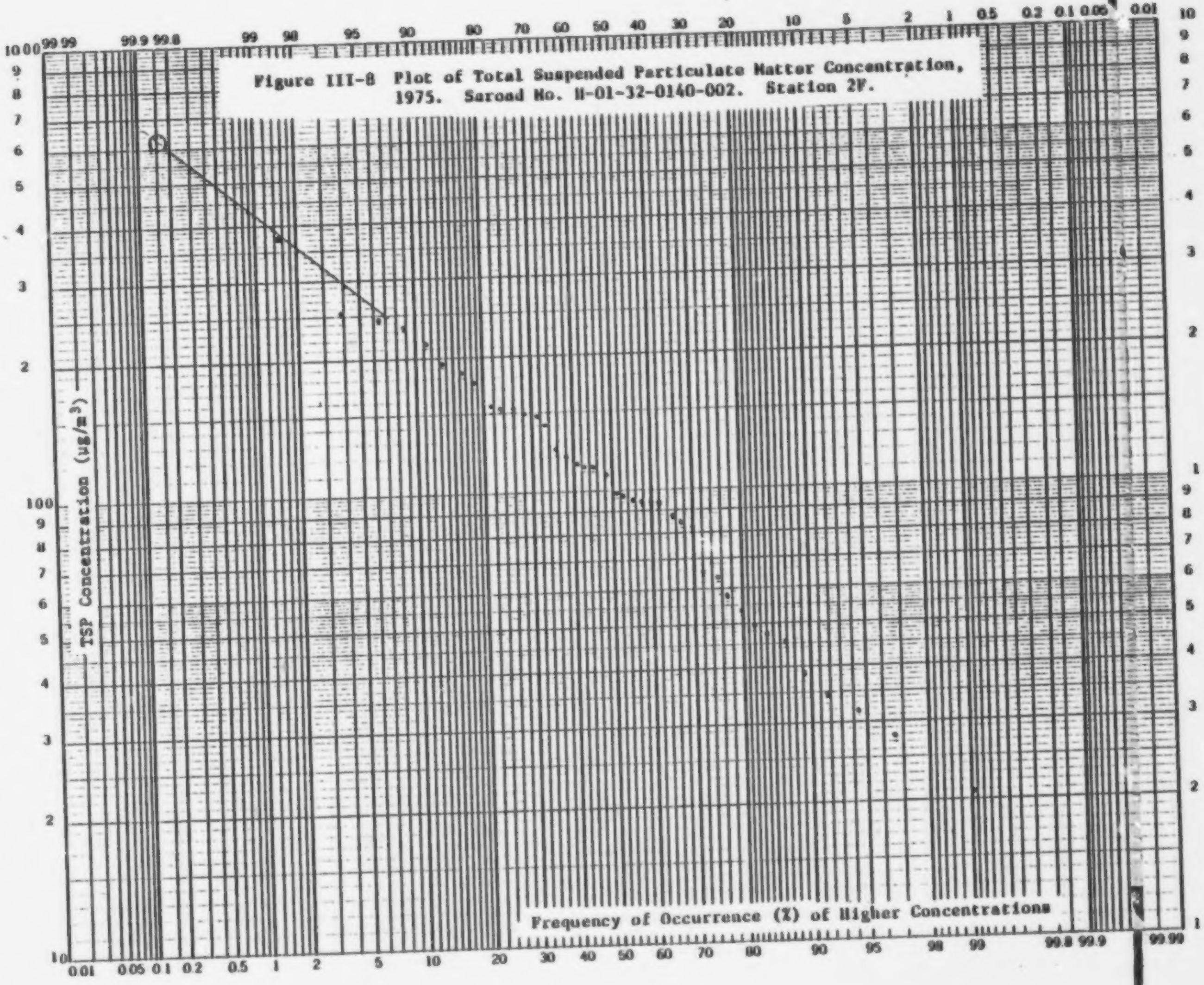


Figure III-8 Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. H-01-32-0140-002. Station 2F.

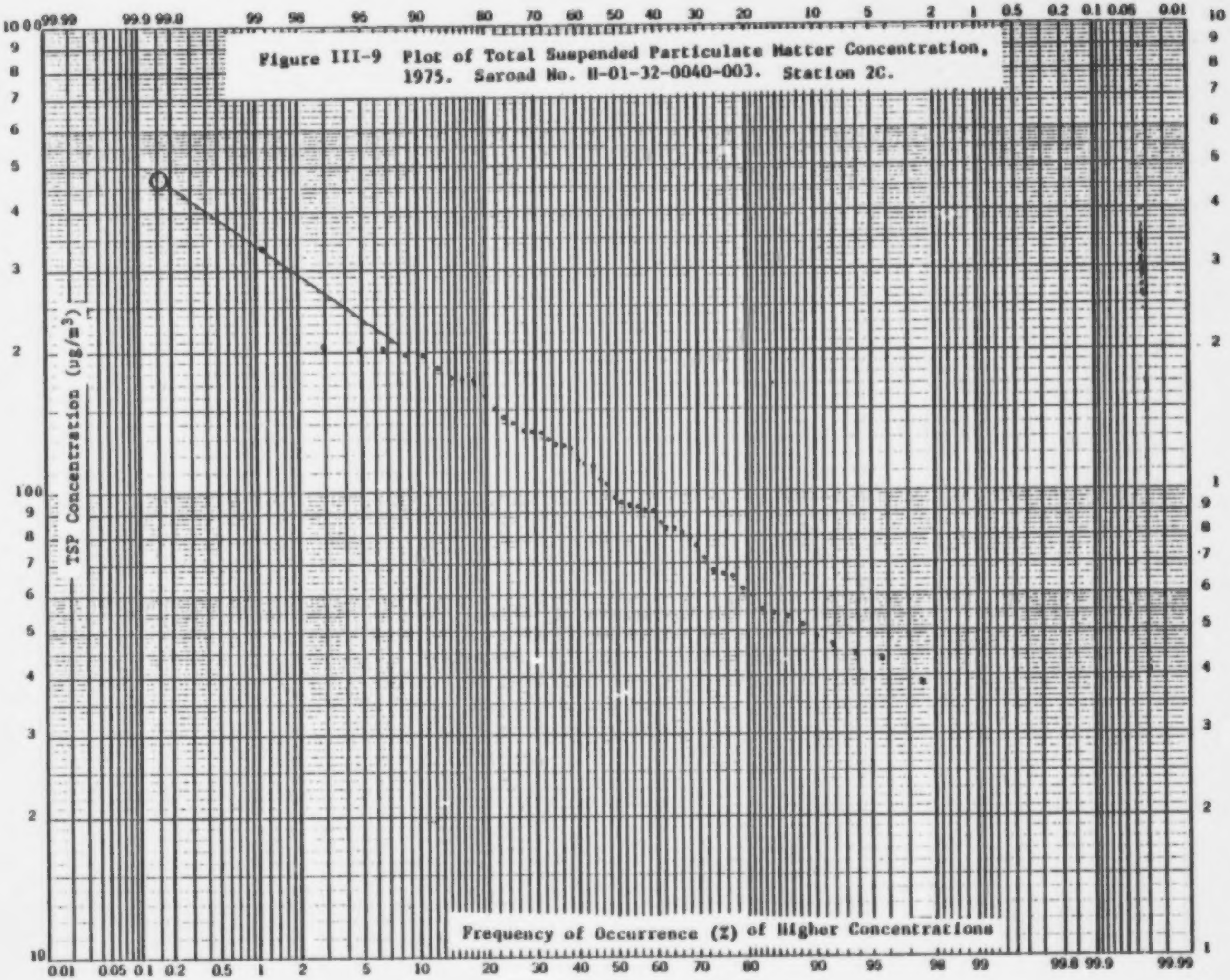


Figure III-9 Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. 11-01-32-0040-003. Station 2C.

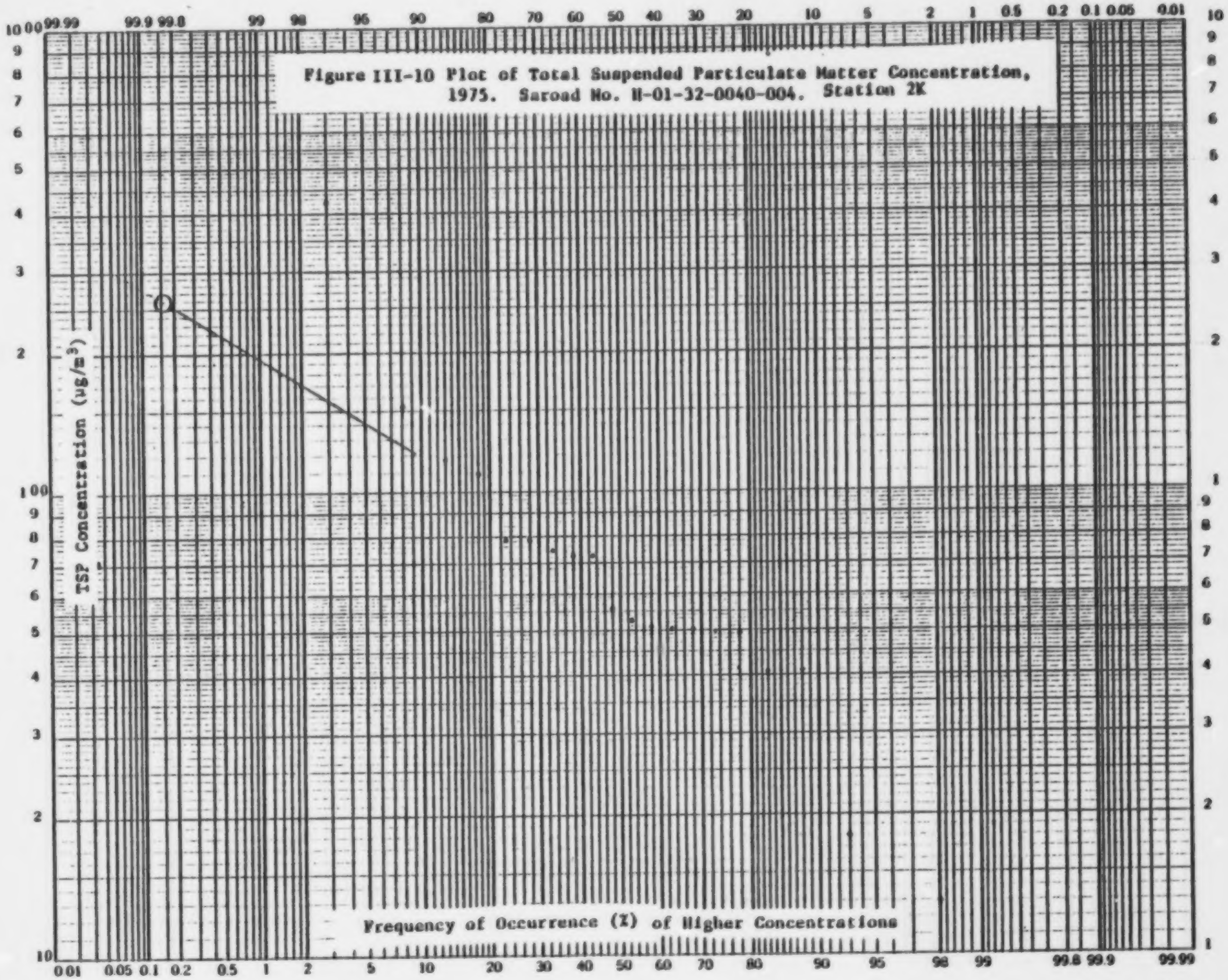


Figure III-10 Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. H-01-32-0040-004. Station 2K

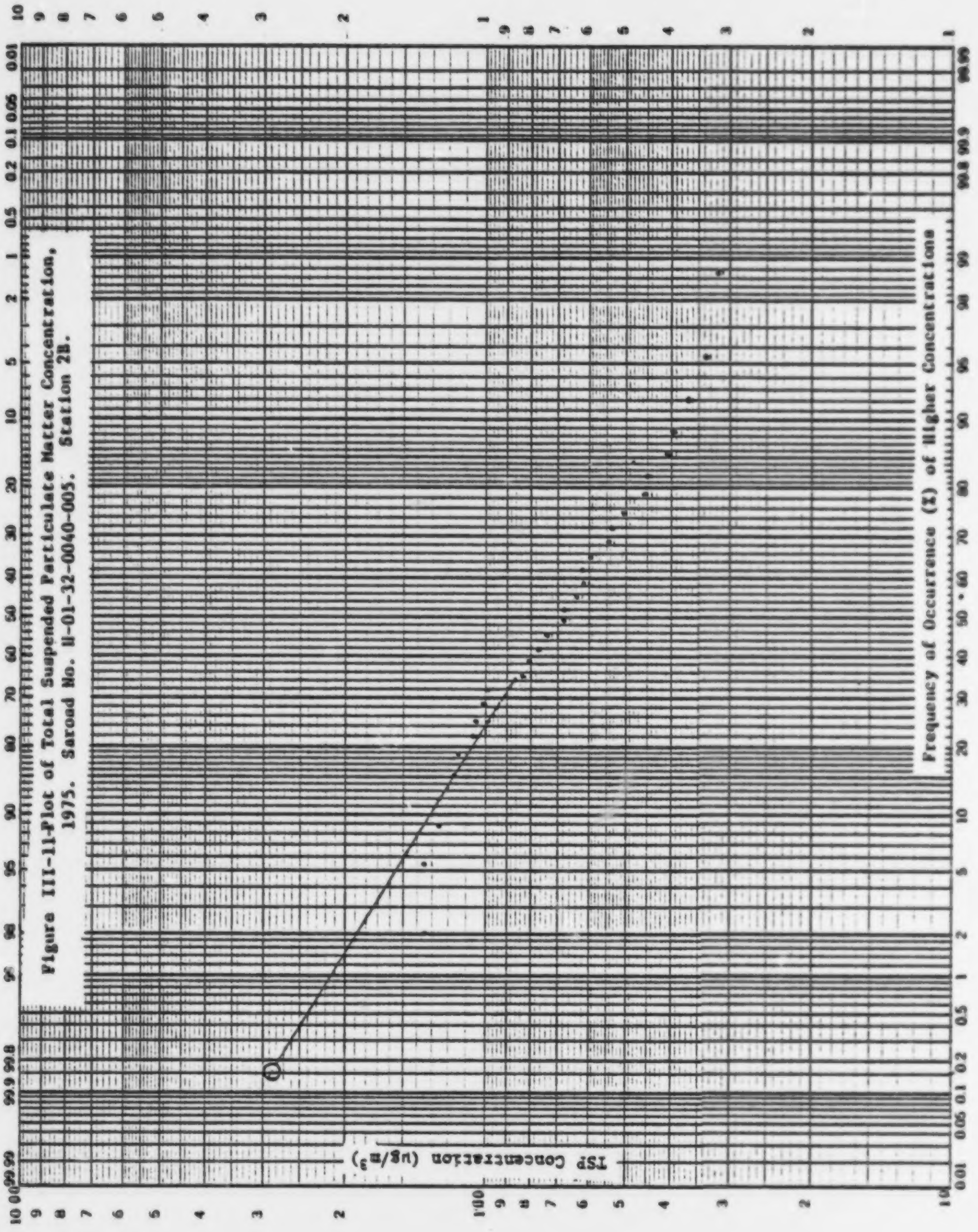


Figure III-11-Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. H-01-32-0040-005. Station 2B.

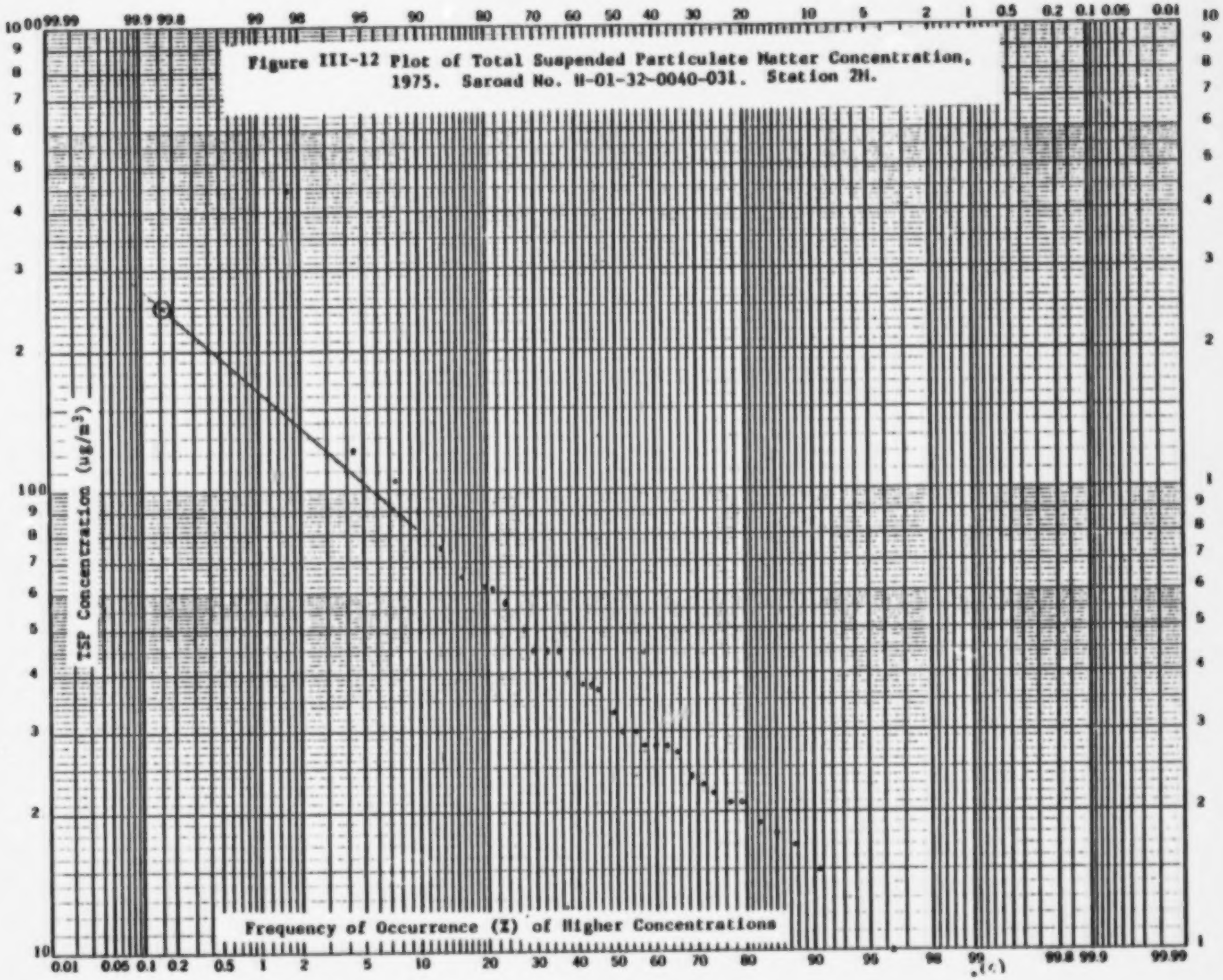


Figure III-12 Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. H-01-32-0040-031. Station 2H.

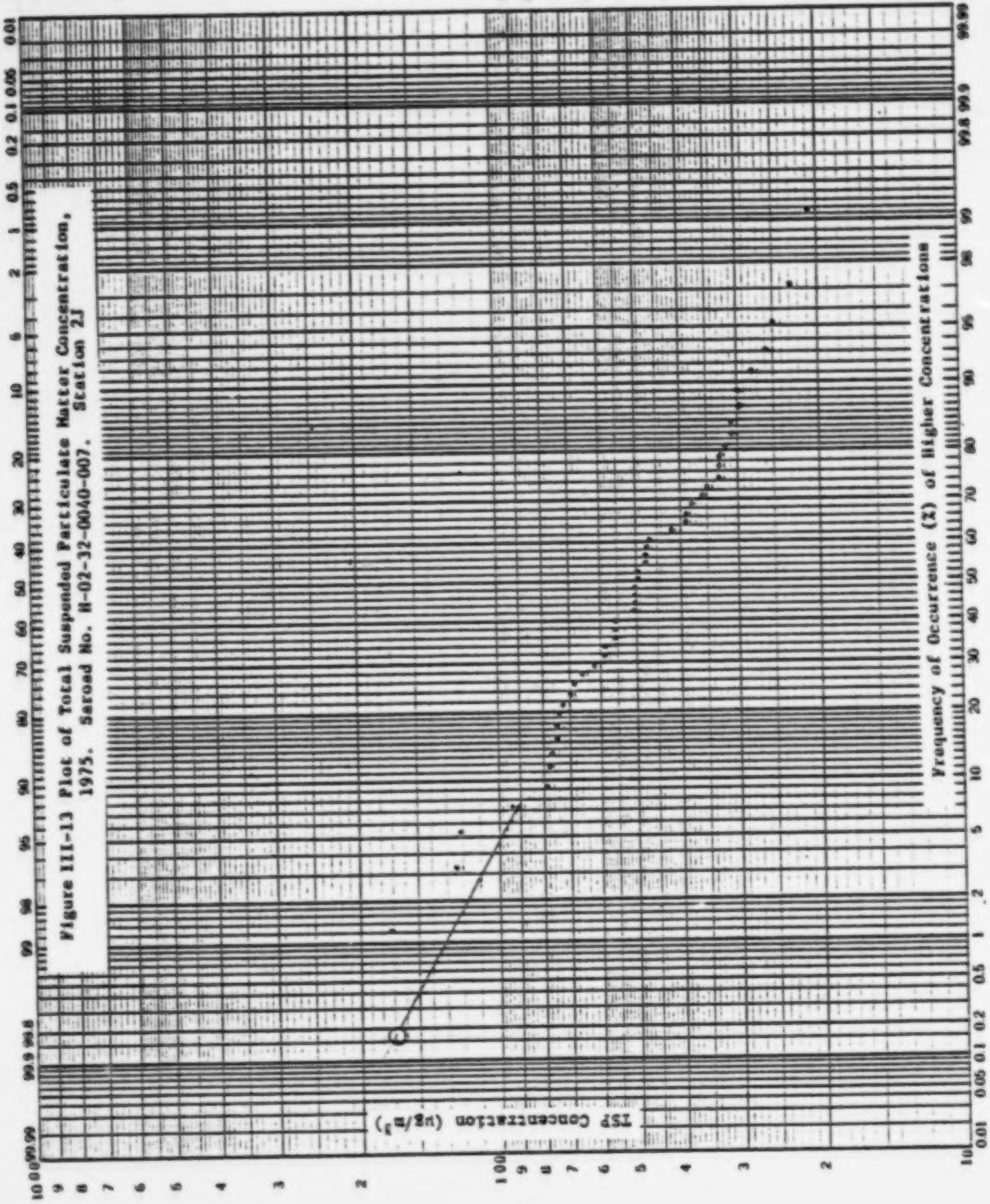


Figure III-13 Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. H-02-32-0040-007. Station 2J

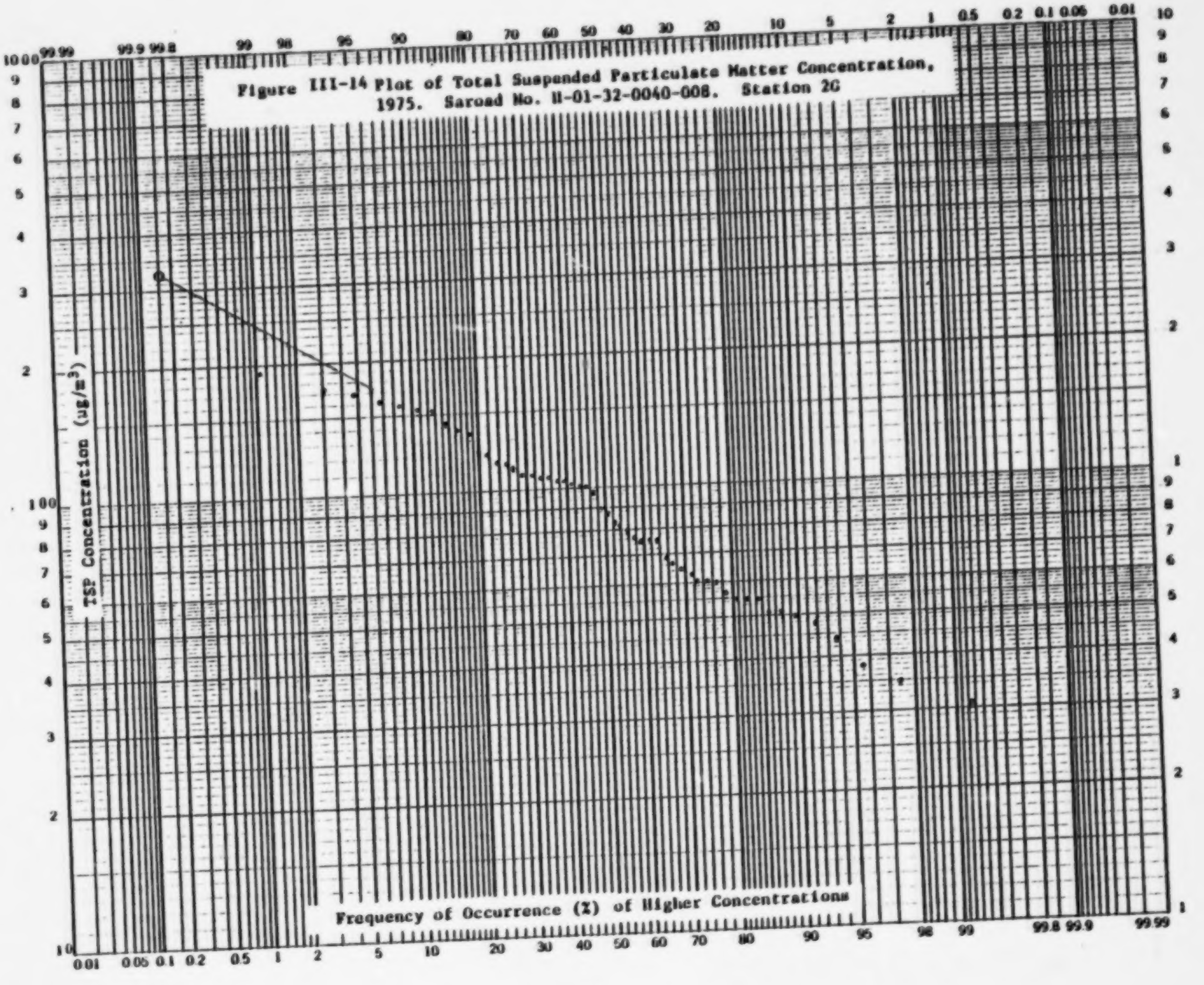


Figure III-14 Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. H-01-32-0040-008. Station 2G

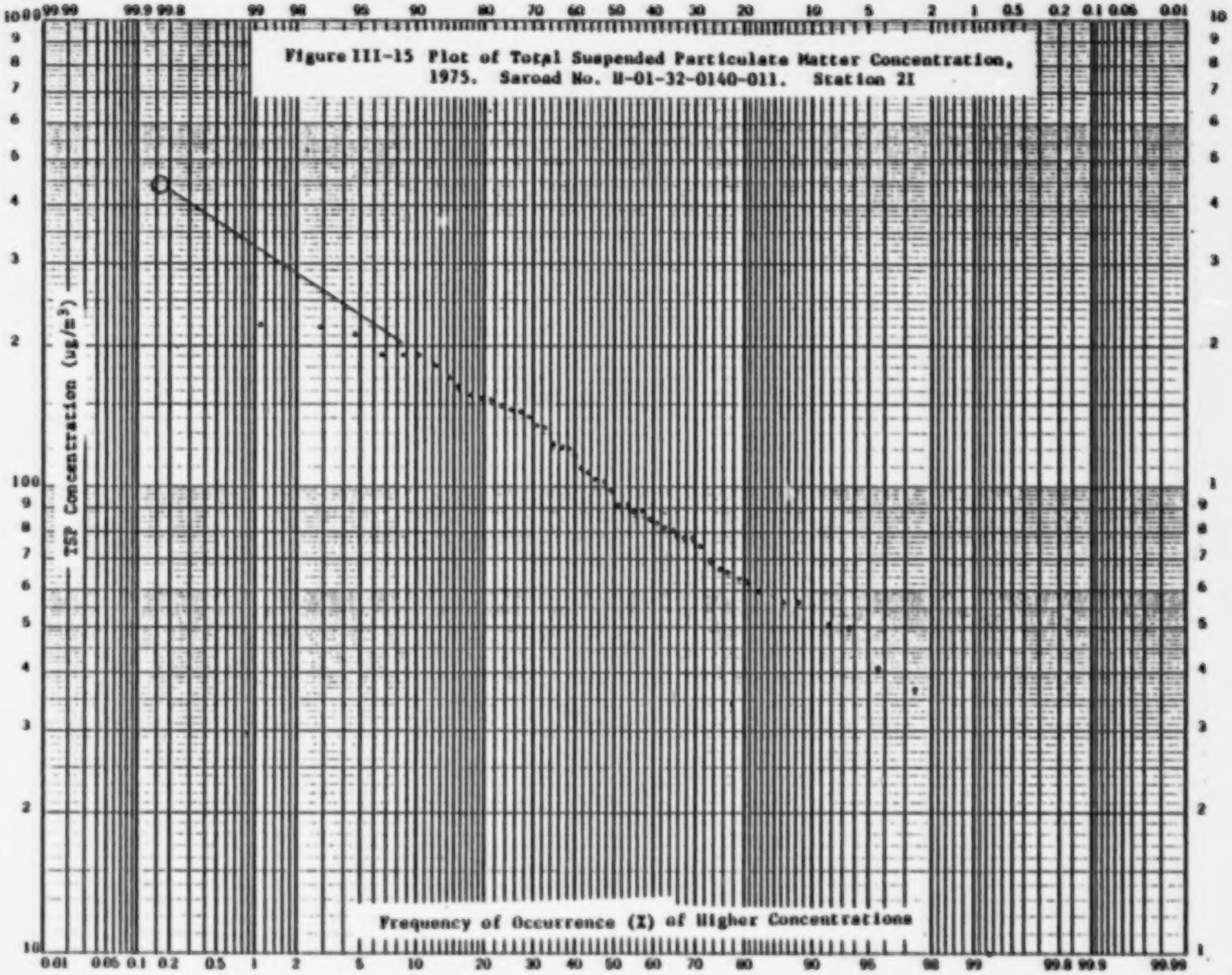


Figure III-15 Plot of Total Suspended Particulate Matter Concentration, 1975. Saroad No. 11-01-32-0140-011. Station 21

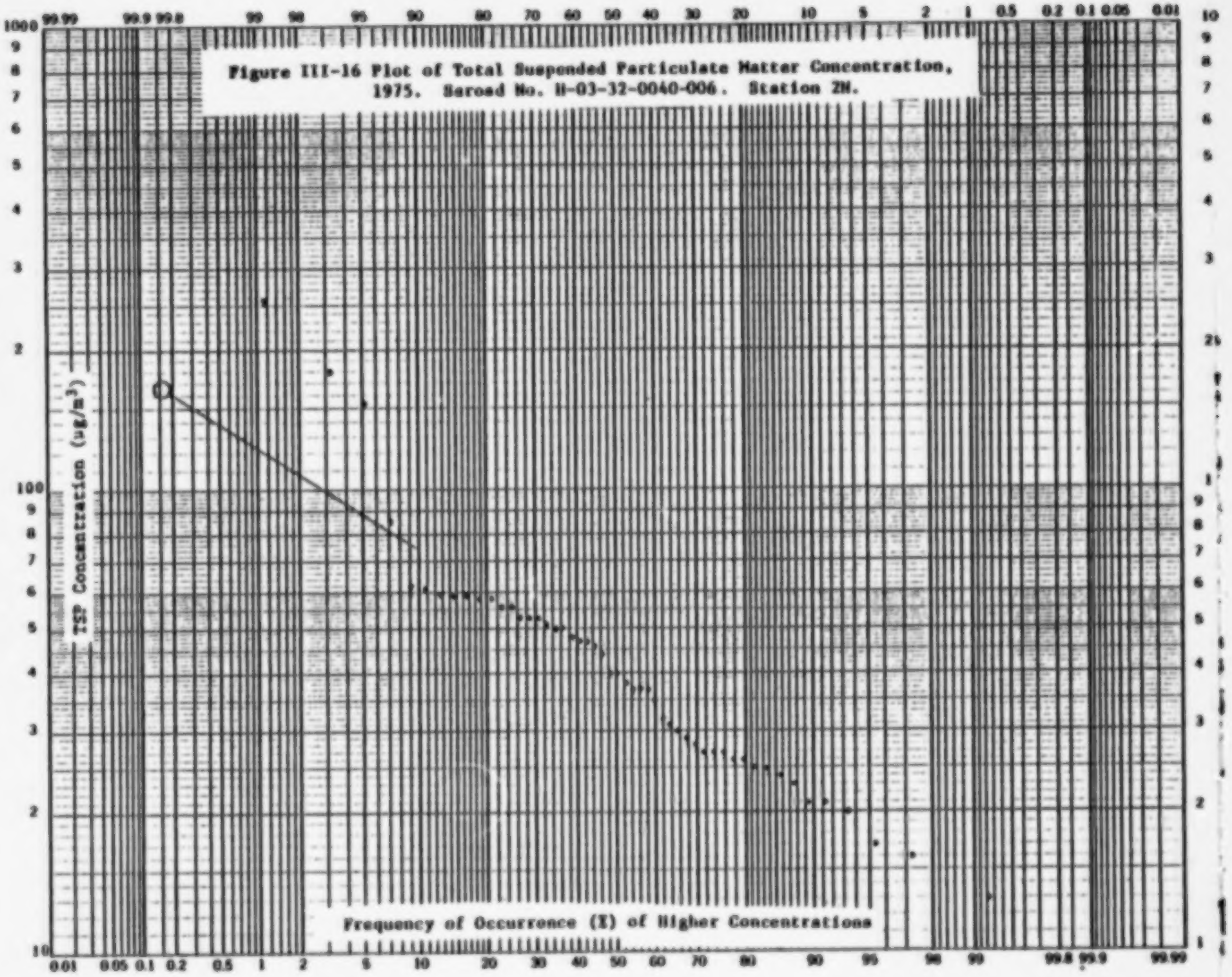


Figure III-16 Plot of Total Suspended Particulate Matter Concentration, 1975. Sarosd No. H-03-32-0040-006. Station 2N.

Table III-1 summarizes the TSP data collected in Bernalillo County. The expected maximum values presented in the table were estimated as mentioned above. The only station that did not measure a violation of the 24-hour standard, nor was its expected maximum concentration above the standard, was Station 2N. The annual geometric mean standard was exceeded at five out of the eleven stations with Stations 2M and 2N reporting the lowest concentrations.

As discussed in Chapter II, the particulate emission inventory was updated to include all of the traditional source categories but with the addition of two "new" source categories: re-entrained dust from paved roads and natural wind-blown dust. Table III-2 summarizes the estimated emissions using the methodologies discussed in Chapter II. As shown, natural wind-blown dust estimates far exceed all other source categories. Transportation related sources are estimated to cause much higher emissions than any sources other than the natural wind-blown dust. The particulate emissions are estimates and should be interpreted as such. The method used to estimate the wind-blown dust was derived from a USDA procedure used to estimate soil erosion from agricultural operations. The use of that procedure in this manner has not been validated by any field investigation. The wind-blown dust emission estimates are considered by ES to be the least reliable of all source categories. The unpaved road emissions estimates are also questionable not because of the methodology but because several assumptions had to be made concerning the total mileage of unpaved roads, the average daily traffic and the average speed. The re-entrained dust emission estimates from paved roads are also extremely questionable since studies conducted in other states have concluded very different emission factor estimates.

With the above mentioned emission inventory the AQDM was run for 1975 using meteorological data gathered at the Albuquerque International Airport. Figure III-17 shows a plot of observed annual average TSP levels at each of the eleven monitors versus the calculated levels using the AQDM. The model predicted levels two to four times larger than what was observed. One calibration/validation approach would be to construct a "least squares" line of best fit through the data points and assume

TABLE III-1

TOTAL SUSPENDED PARTICULATE MATTER LEVELS FOR BERNALILLO COUNTY, JANUARY - DECEMBER, 1975 ($\mu g/m^3$)

Station No.	Number of Samples	Arithmetic Mean ($\mu g/m^3$)	Geometric Mean ($\mu g/m^3$)	Standard Geo.Dev.	Measured Maximum ($\mu g/m^3$)	Expected Maximum ($\mu g/m^3$)
002-2F	41	118	98	1.8	375	630
003-2C	54	112	96	1.6	333	475
004-2K	20	83	62	1.6	425	260
005-2B	30	77	70	1.4	133	287
006-2N	51	49	40	1.6	254	165
007-2J	49	55	55	1.5	172	270
011-2I	54	109	75	1.9	222	445
008-2G	53	94	86	1.6	194	325
031-2M	36	51	35	1.7	443	250
001-2D	34	107	88	1.5	434	395
002-2E	37	89	78	1.7	250	355

NOTE: National Ambient Air Quality Standards Are:

Annual Geometric Mean	75 $\mu g/m^3$
24-hour Maximum	260 $\mu g/m^3$

TABLE III-2

SUMMARY OF ESTIMATED PARTICULATE EMISSIONS - 1975
ANNUAL EMISSION RATES

Source Category	Bernalillo*		Santa Fe*		Dona Ana*		Bernalillo**	
	Tons/Day	% of Total	Tons/Day	%	Tons/Day	%	Tons/Day	%
Stationary Point Sources	3.8	0.14	0.14	0.00	0.03	0.00	1.8	0.07
Aggregate Storage/Construction/Fuel Usage/Space Heating/etc.	7.4	0.26	0.39	0.01	0.51	0.01	7.4	0.27
Tire and Exhaust	5.1	0.18	3.8	0.12	6.5	0.12	4.2	0.16
Re-entrain Dust from Paved Roads	18.2	0.64	0.4	0.01	1.7	0.03	36.4	1.35
Unpaved Roads	275.3	9.75	273.1	8.40	166.9	2.97	144.9	5.37
Natural Wind-Blown Dust	2514.4	89.03	2975.35	91.46	5444.13	96.87	2501.9	92.78
County Totals	2824.2	100.00	3253.18	100.00	5619.77	100.00	2696.9	100.00

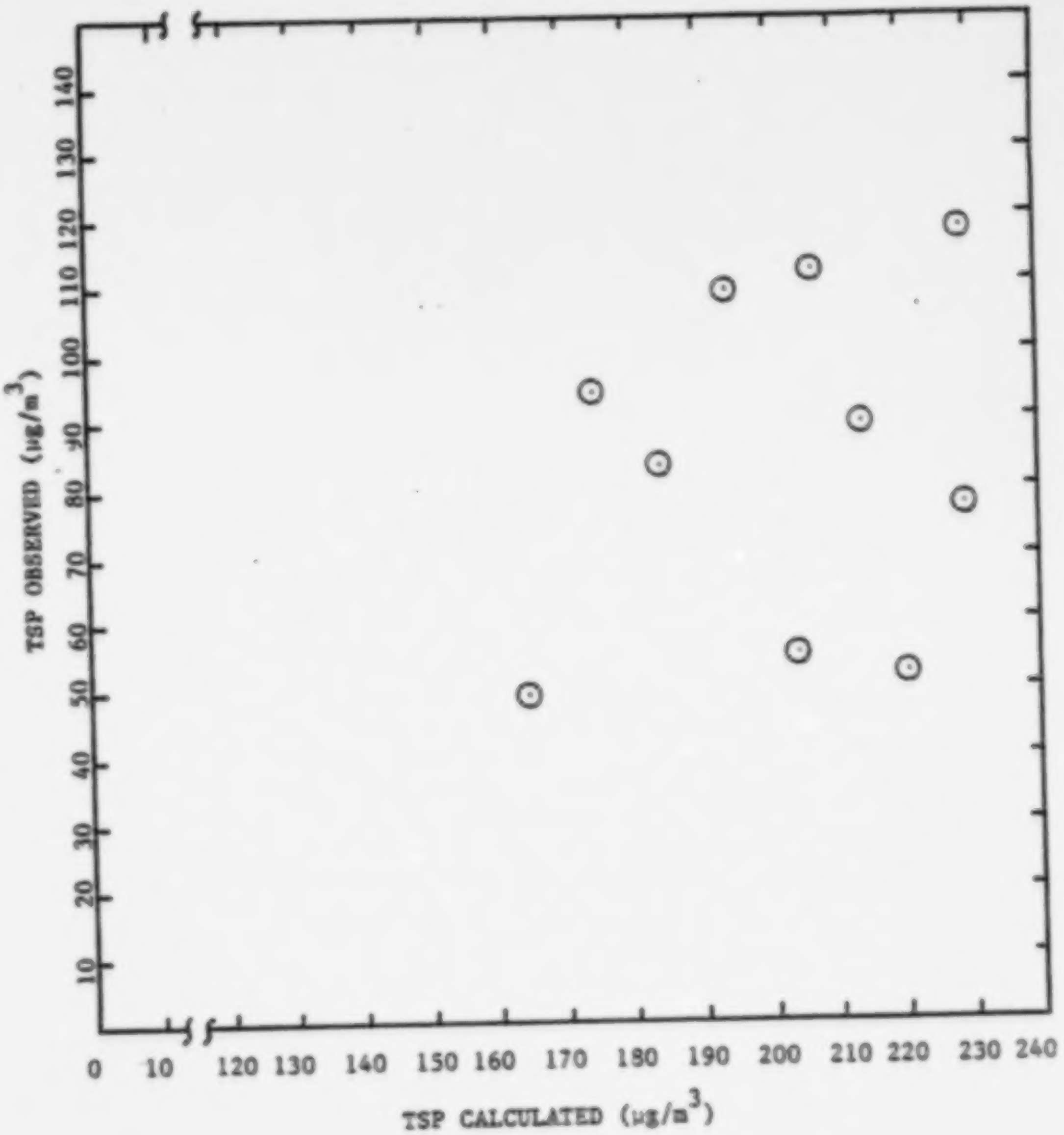
*Emission Inventory Corrected as per Linear Programming
**Not Corrected as per Linear Programming

FIGURE III-17

CALCULATED VERSUS OBSERVED

ANNUAL AVERAGE TSP CONCENTRATIONS (μg/m^3) IN BERNALILLO COUNTY, 1975

ALL SOURCE CATEGORIES INCLUDED

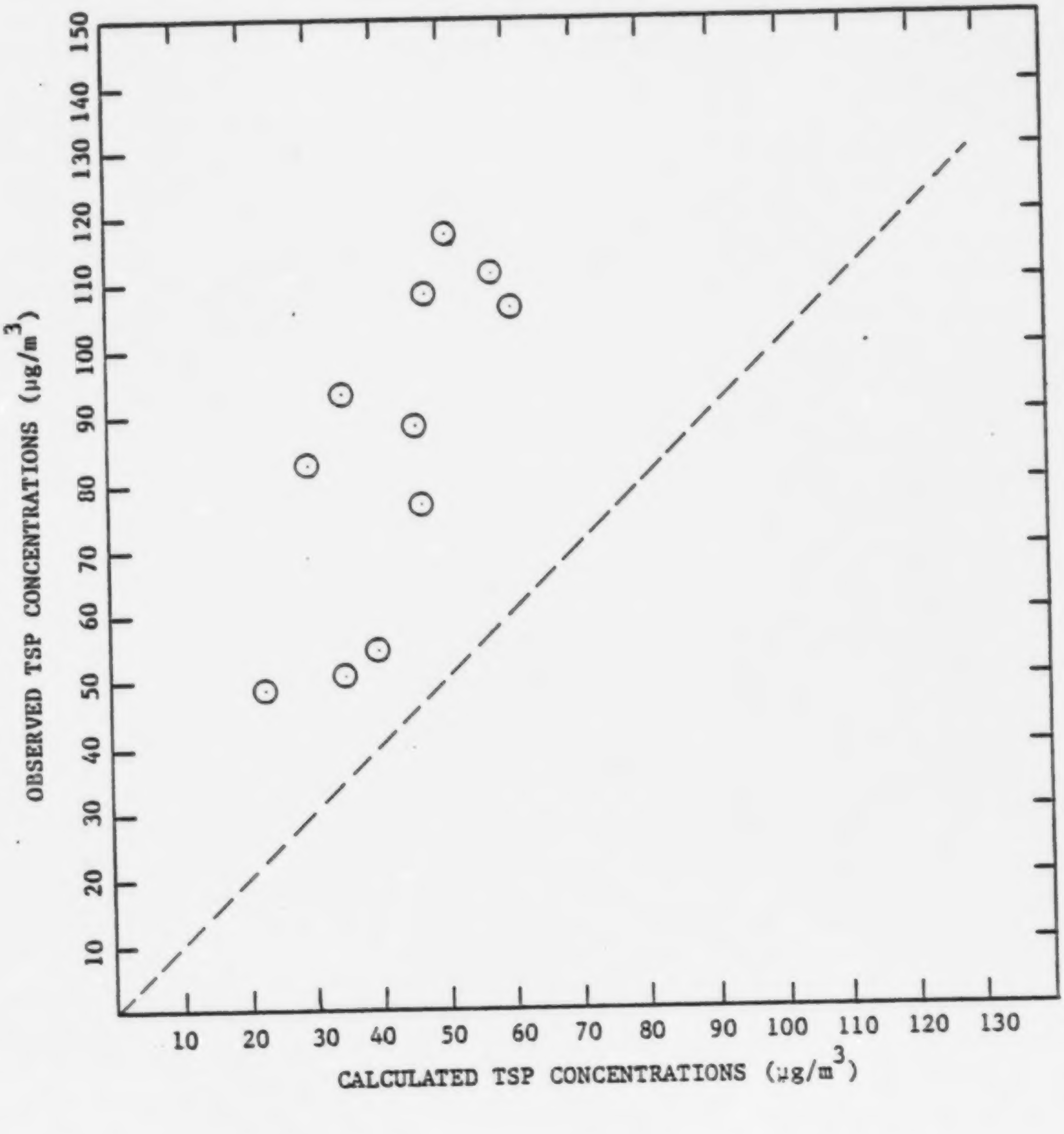


that the slope and intercept become the calibration curve for the model. This procedure is outlined in detail in the AQDM user's manual and is the accepted practice with this model. However explicit in that calibration method is the underlying assumption that the dispersion algorithm is in error not the input data. But, as mentioned above, the emission estimates were based on algorithms certainly of no more accuracy than the dispersion algorithm. Indeed, the basic data base of the emission estimates (VMT's, production rates, etc.) should not be considered more accurate than the meteorological data base (wind speed, direction, etc.) that was incorporated into the AQDM. With that in mind, it was decided that a least squares line of best fit not be used as a calibration factor but rather a review of the emission data would be conducted.

Since the natural wind-blown dust estimates are the least reliable, the AQDM was run without those emissions. The resulting observed versus calculated concentrations are shown in Figure III-18. As would be expected, the calculated levels were significantly reduced. Indeed, the calculated concentrations were approximately one-half the observed TSP levels. One might use the least-squares line of best fit for the above curve and assume that the wind-blown dust emissions causes a general "background" or "unaccounted for" TSP level. If that procedure is used, then all incremental source contributions to the calculated TSP levels would be increased by the same factor. This would force the model to increase its estimate of the impact of stationary point sources as well as all other source categories. In numerous other studies, it has been shown that the AQDM over-estimates the impact of point sources in many cases by its use of the Holland plume rise equation. By assuming a least-squares calibration curve, the potential over-estimation of point sources would be enhanced.

An alternative approach to the validation/calibration of the AQDM dispersion model would be to validate/calibrate the emission models. That method would imply that the emission models were no more accurate than the dispersion model. To accomplish this emission model validation, it was necessary to derive a completely different validation/calibration procedure than the least-squares method. It was decided

FIGURE III-18
CALCULATED VERSUS OBSERVED
ANNUAL AVERAGE TSP CONCENTRATIONS (μg/m³) IN BERNALILLO COUNTY, 1975
WINDBLOWN DUST OMITTED



that linear-programming, an operations research approach, would be useful in developing the calibration parameters. The incremental impact of each source category as calculated by the AQDM was divided by the total estimated emission rate for each category to establish a normalized impact ($\mu g/m^3$ per ton/day emissions) to be used in the linear program. The linear program was established to calculate the optimal change in emission rates in each source category without allowing the calculated TSP levels to differ by more than 10 percent from the observed concentrations. Five monitoring stations were selected for the optimization process; the four that measured the highest TSP concentrations and the one that measured the lowest TSP concentrations.

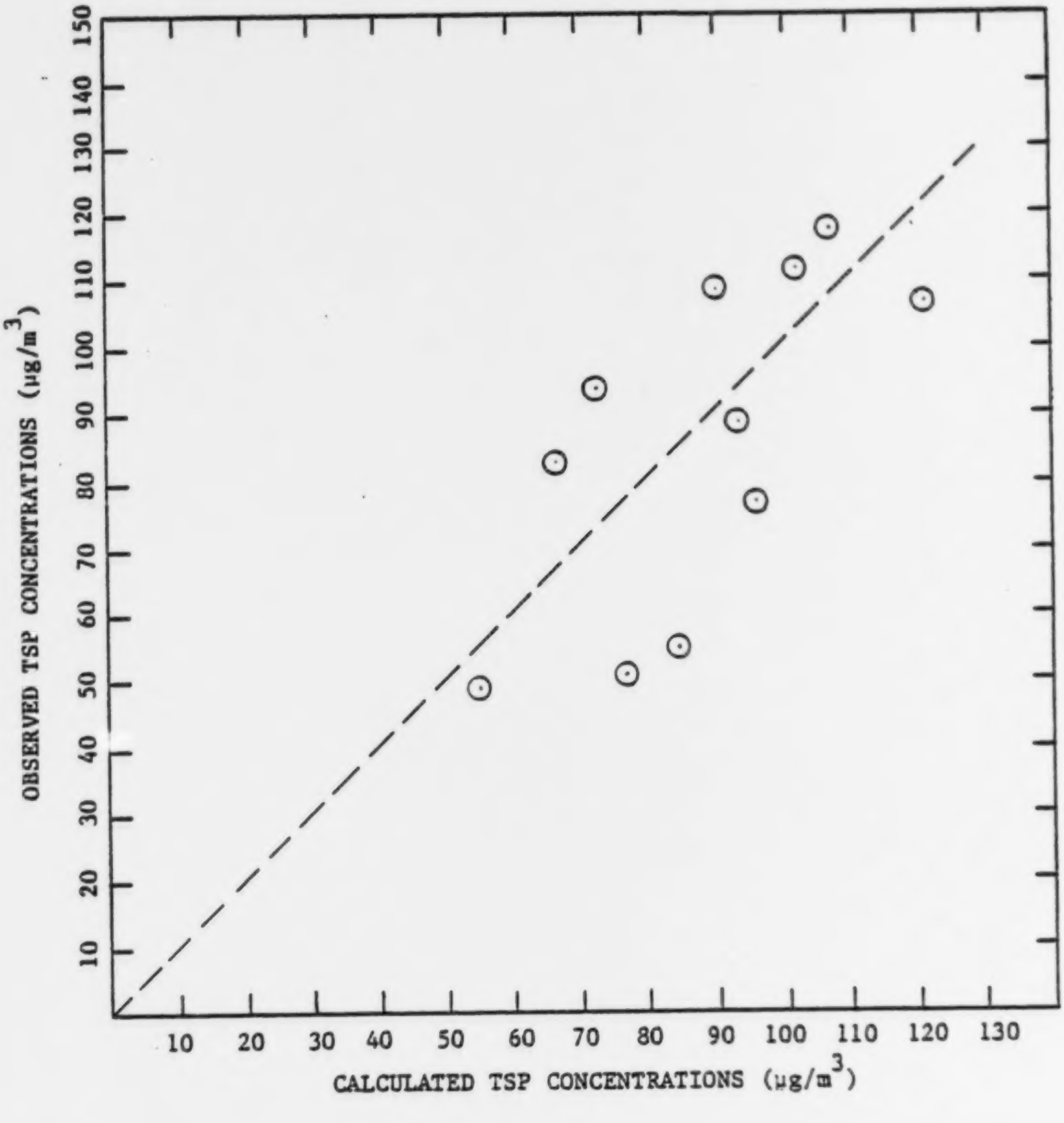
A review was conducted of the emission estimates for each source category to determine reasonable limits that the emission rates would be allowed to vary within the linear program. The review showed that a reasonable limit for the tire and exhaust emissions would be ± 20 percent. The paved/unpaved road emission estimates could vary from minus 50 percent of estimated values to plus 100 percent. The wind-blown dust emissions were assumed to be capable of varying from zero to the original estimated rate. A "background" variable was added to the linear program to account for any TSP levels not estimated by the above source categories. No variations were allowed for the other source categories since the reliability of those estimates is thought to be more superior. Aggregate storage emissions were not included in the linear program.

The results of the linear program are that the optimal solution is to disregard the estimated wind-blown dust emission estimates but to account for those emissions with a "background" concentration of 18 $\mu g/m^3$. The optimal solution also included increasing the estimated tire and exhaust emissions by 20 percent, increasing the estimated unpaved road emissions by 90 percent; and decreasing the estimated re-entrained dust emissions from paved roads by 50 percent. These optimal changes incorporate corrections needed as a result of both incorrect emission algorithms and incorrect base data. Certainly, many alternative objective functions and variable limitations could be constructed and give different "optimal solutions". Several other linear programs were developed but gave similar results when the stringent limitations were placed upon the variation of the calculated concentrations as compared to the observed concentrations.

The above "corrections" were included in an "optimal emission inventory" and the AQDM was again run for each of the eleven TSP monitors. Figure III-19 shows the observed TSP levels versus the calculated TSP levels using the "optimal" emission corrections. The data points tend to lie on the observed equal calculated line very well. Certainly this "calibration" is more reasonable than the two previous attempts.

Using the above mentioned "corrections" to the emission rates, the AQDM was run for 1975, 1978, 1980, and 1985 (see Appendix A). Figure III-20 shows the estimated spatial distribution of TSP in Bernalillo County and Figure III-21 shows the estimated TSP levels expected by the year 1985. A significant increase is indicated for the urban area around Albuquerque as would be expected from the OBERS growth projections for each of the source categories. An increase of approximately 35 percent can be expected over a large section of the urban area. This increase in annual average TSP will bring a correspondingly higher frequency of violations of the 24-hour NAAQS. A statistical analysis of the 1975 levels indicates that the expected 24-hour maximum concentration as determined by Larsen's methodology at a particular station may be three to five times higher than the annual arithmetic mean observed at the station. Therefore, large areas of the county are expected to continue to violate both the long-term and short-term NAAQS for total suspended particulate matter.

FIGURE III-19
CALCULATED VERSUS OBSERVED
ANNUAL AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) IN BERNALILLO COUNTY, 1975
OPTIMAL EMISSION CORRECTIONS INCLUDED



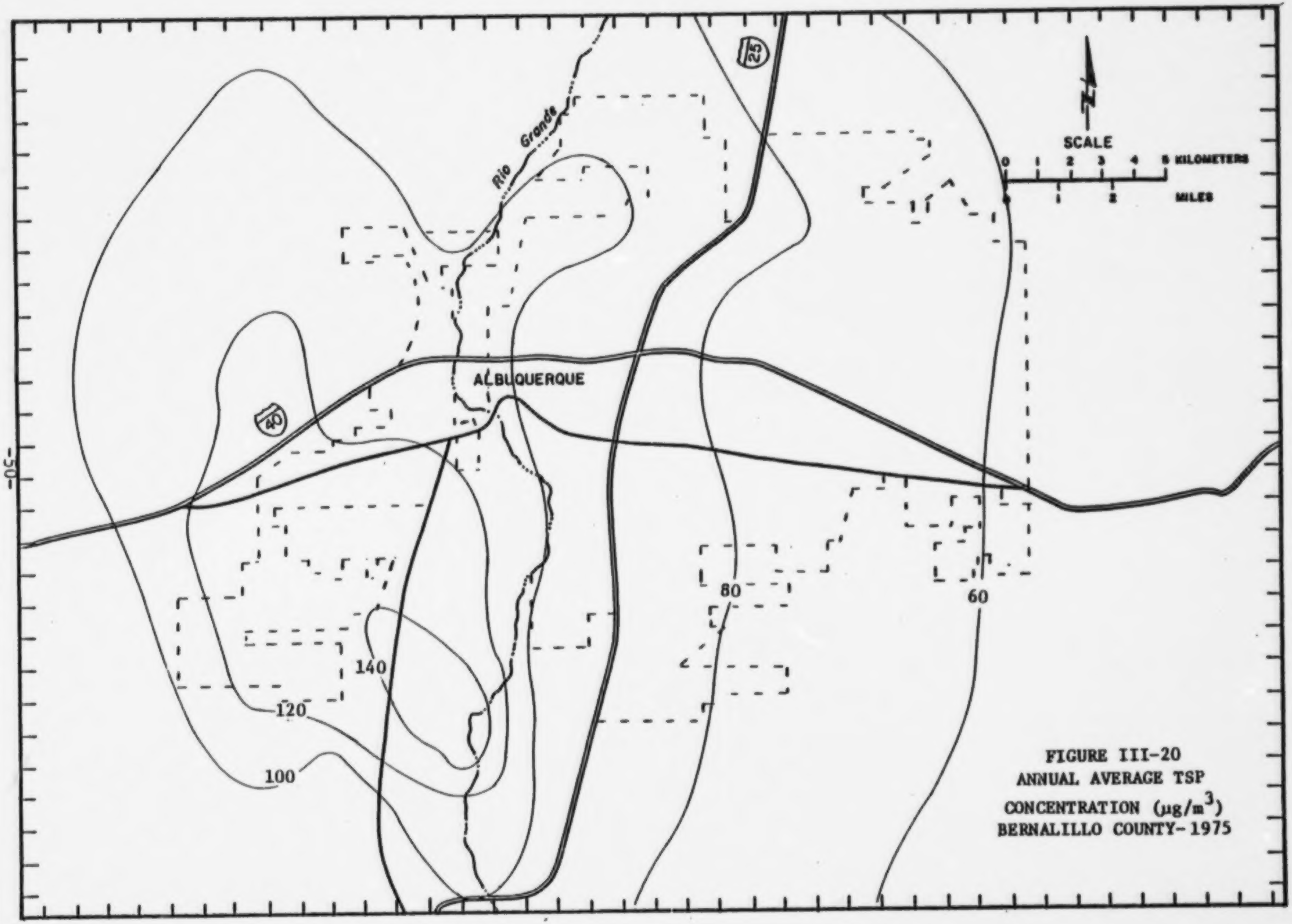

SCALE
0 1 2 3 4 5 KILOMETERS
0 1 2 MILES
Rio Grande
25
40
ALBUQUERQUE
60
80
100
120
140

FIGURE III-20
ANNUAL AVERAGE TSP
CONCENTRATION ($\mu g/m^3$)
BERNALILLO COUNTY-1975

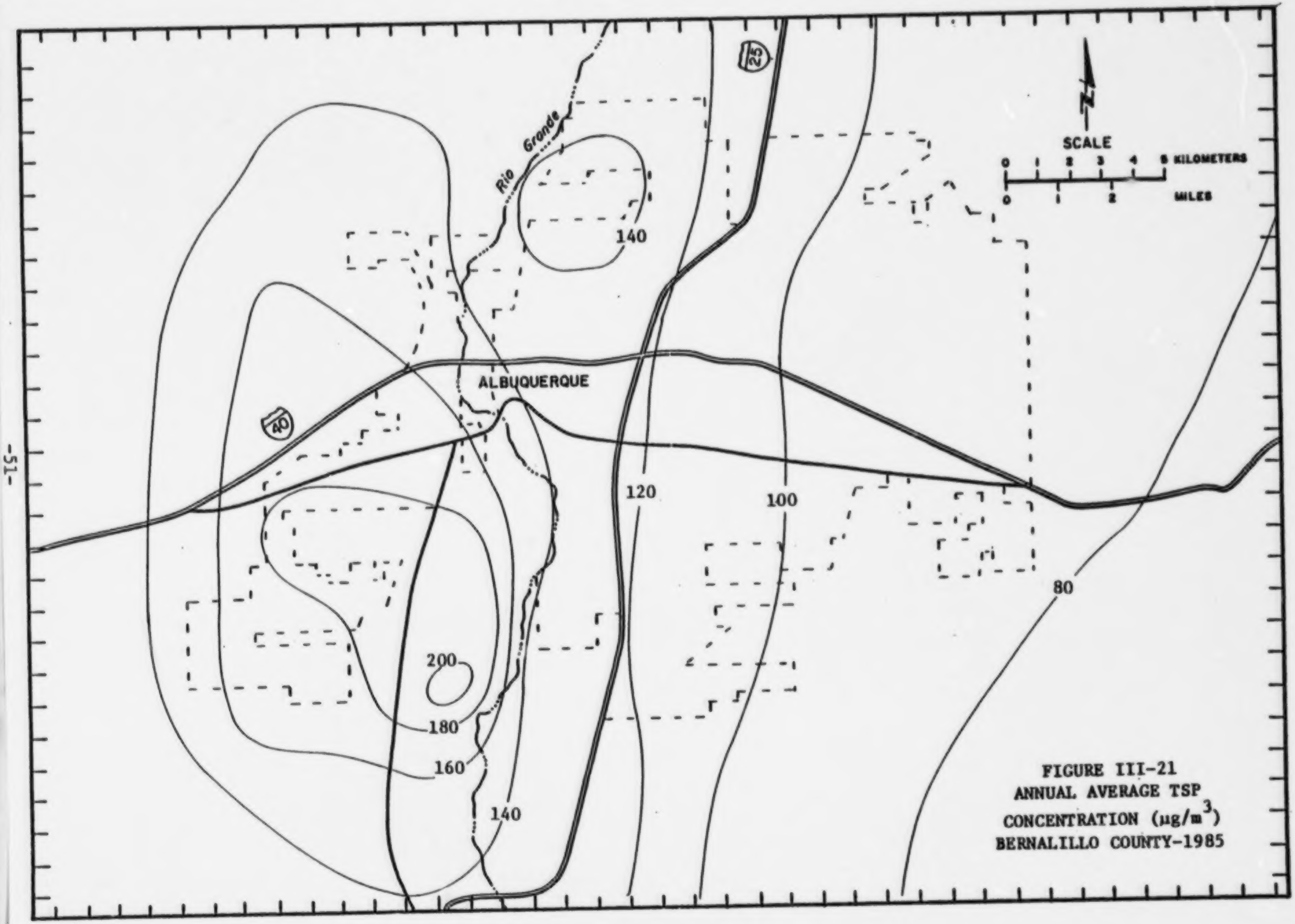

SCALE
0 1 2 3 4 5 KILOMETERS
0 1 2 MILES
Rio Grande
ALBUQUERQUE
25
40
140
200
180
160
140
120
100
80

FIGURE III-21
ANNUAL AVERAGE TSP
CONCENTRATION ($\mu g/m^3$)
BERNALILLO COUNTY-1985

SANTA FE COUNTY

During 1975, there were three high volume samplers collecting data on a once every sixth day schedule. All three sites were on top of buildings in Santa Fe and should be representative of the general area. Table III-3 summarizes the TSP data collected in Santa Fe for 1975. As shown, no violations of the annual geometric mean nor 24-hour maximum NAAQS were reported for 1975.

Figure III-22 shows the calculated versus observed TSP concentrations using the AQDM as discussed in the previous sections. The emission estimates were "corrected" by the same factors as determined for Bernalillo County and a past five year meteorological summary (1950-1954) was used to represent the 1975 meteorology. As shown, the three data points for Santa Fe are within the same general pattern of the Bernalillo data. The AQDM will over-estimate the TSP at two stations and under-estimate the levels observed at the other.

Figure III-23 shows the estimated spatial distribution of TSP in Santa Fe County in 1975 as calculated by the AQDM. The calculated values showed an increase gradually through 1985. Some areas of the county will increase the TSP levels by 35 percent by 1985. Figure III-24 shows the estimated annual average TSP levels for 1985. As shown, a large area will be above 80 $\mu g/m^3$ on an annual average. This 80 $\mu g/m^3$ should correspond to a geometric mean of approximately 75 $\mu g/m^3$. Therefore, by 1985 there will be a large area of Santa Fe that will exceed the annual geometric mean NAAQS for TSP. As mentioned above, the annual average TSP levels are calculated to be over 70 $\mu g/m^3$ in a small area. While this value is below the annual geometric mean NAAQS of 75 $\mu g/m^3$, it is likely that the 24-hour concentrations in that area presently exceed the NAAQS of 260 $\mu g/m^3$. As in Bernalillo County, 24-hour maximum concentrations are usually three to five times larger than the annual arithmetic mean concentrations.

The emission inventory for 1978, 1980 and 1985 were developed as indicated in Chapter II and were used to estimate the TSP levels with the AQDM. Statistical trend analysis showed that the maximum 24-hour concentration is three to five times the magnitude of the arithmetic mean, therefore, a large area of Santa Fe is also expected to exceed the 24-hour NAAQS.

TABLE III-3

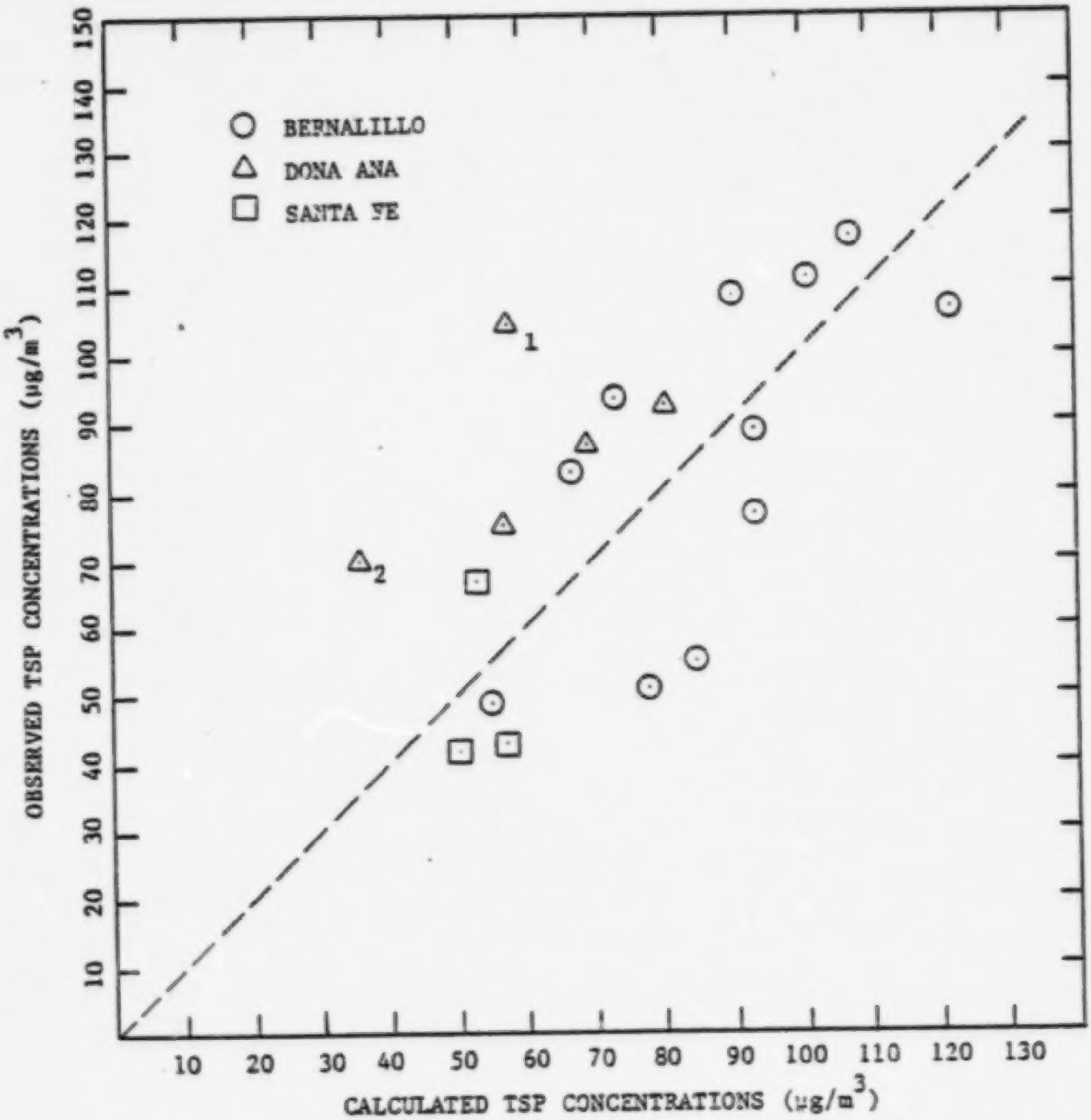
SUMMARY OF TOTAL SUSPENDED PARTICULATE MATTER DATA COLLECTED IN SANTA FE COUNTY - 1975

		TSP Concentration ($\mu g/m^3$)			
Station Number	No. of Observations	Annual Arithmetic Average	Annual Geometric Average	Measured Maximum	Measured Minimum
3H	45	67	61	193	17
3W	48	43	39	77	8
3A	54	42	38	125	11

Note: The primary NAAQS' are: 75 annual geometric mean; 260 maximum 24-hour.

The secondary NAAQS' are: 60 annual geometric mean; 150 maximum 24-hour.

FIGURE III-22
OBSERVED VERSUS CALCULATED ANNUAL AVERAGE TOTAL SUSPENDED PARTICULATE MATTER CONCENTRATIONS ($\mu g/m^3$), 1975
BERNALILLO, DONA ANA AND SANTA FE COUNTIES



NOTES: 1. DATA POINT REPRESENTS THE ANAPRA MONITOR WHICH IS LOCATED NEAR EL PASO, TEXAS. NO EMISSIONS FOR SOURCES OUTSIDE OF DONA ANA COUNTY ARE INCLUDED.

2. DATA POINT REPRESENTS THE HATCH MONITOR WHICH MAY BE INFLUENCED BY SOURCES OUTSIDE OF DONA ANA COUNTY.

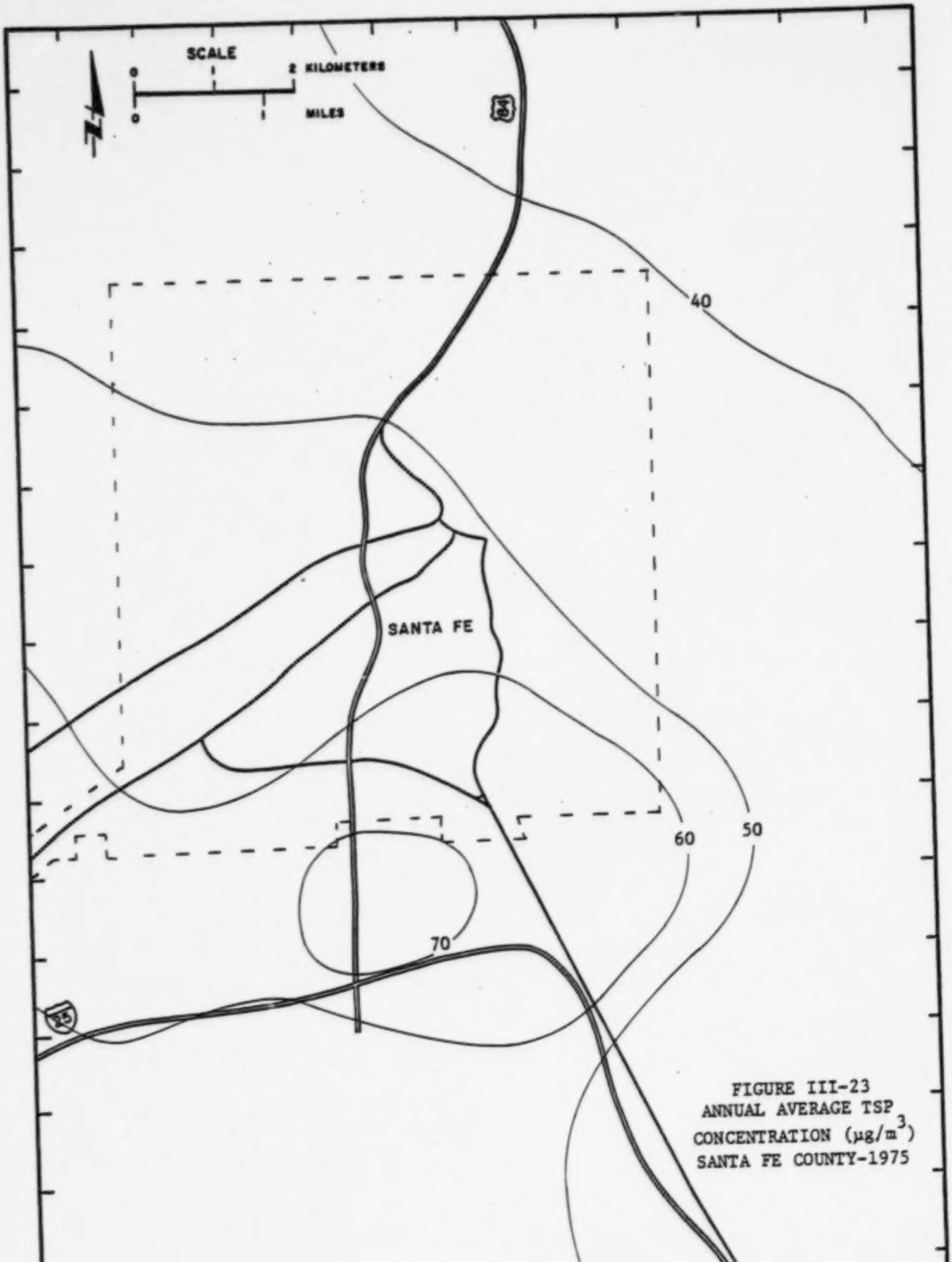

SCALE
0
2 KILOMETERS
0
1
MILES
N
84
40
SANTA FE
60
50
70
25

FIGURE III-23
ANNUAL AVERAGE TSP
CONCENTRATION ($\mu g/m^3$)
SANTA FE COUNTY-1975

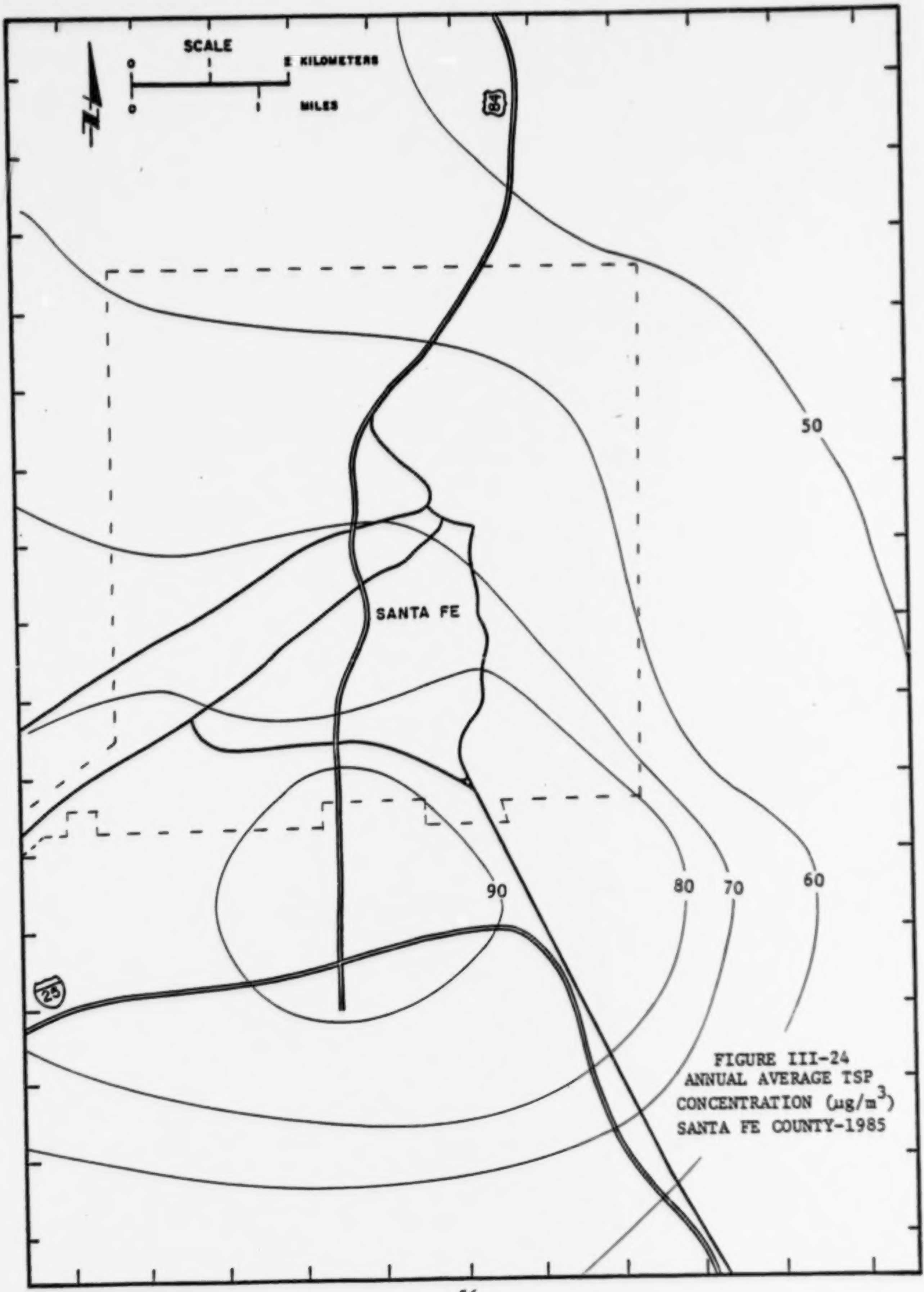

SCALE
0
2 KILOMETERS
0
1
MILES
N
84
SANTA FE
25
50
60
70
80
90

FIGURE III-24
ANNUAL AVERAGE TSP
CONCENTRATION ($\mu g/m^3$)
SANTA FE COUNTY-1985

DONA ANA COUNTY

Six high volume samplers were used in 1975 to collect TSP data in Dona Ana County. All monitors were well located so as not to be overly influenced by local emissions and should represent the general air quality of the county. Table III-4 summarizes the TSP data collected in Dona Ana County for 1975. As shown, three out of the six monitors recorded violations of the NAAQS.

Figure III-22 shows the calculated versus observed TSP concentrations using the AQDM as discussed in the previous sections. The emission estimates were "corrected" by the same factors as determined for Bernalillo County and a past five year meteorological summary (1950-1954) was used to represent the 1975 meteorology. As shown, all six data points for Dona Ana County are above the dashed line indicating that the model under-estimates the TSP levels at all sites. The Anapra monitor is probably influenced by the emissions outside of Dona Ana County (i.e., El Paso) and it is reasonable that the model under-estimates the concentration since no emissions outside the county were considered. The Hatch monitor (Note 2) was also located near the county line and that may account for some of the discrepancy from the dashed line. However, it is apparent that the model "calibration" that seems appropriate for Bernalillo and Santa Fe Counties may have to be altered for Dona Ana County. One solution is to add 20 $^{\mu g}/_{m^3}$ to the calculated TSP concentrations as another "background" or "unaccounted for" concentration. The total "background concentration" would become 38 $^{\mu g}/_{m^3}$.

Figure III-25 shows the estimated spatial distribution of 1975 annual average TSP levels in Dona Ana County that includes the additional background. As shown, a large area is expected to have an arithmetic average over 80 $^{\mu g}/_{m^3}$ which will correspond to approximately a geometric mean of 75 $^{\mu g}/_{m^3}$. Therefore, a large area of the county was above the annual geometric mean NAAQS in 1975. As discussed in the previous sections, the 24-hour maximum concentrations will be three to five times the magnitude of the annual average concentration and, therefore, large areas also exceeded the 24-hour NAAQS of 260 $^{\mu g}/_{m^3}$.

TABLE III-4

SUMMARY OF TOTAL SUSPENDED PARTICULATE MATTER DATA COLLECTED IN DONA ANA COUNTY - 1975

		TSP Concentration (ug/m^3)			
Station Number	No. of Observations	Annual Arithmetic Average	Annual Geometric Average	Measured Maximum	Measured Minimum
6B	44	81	70	341	22
6C	47	93	78	255	21
6D	44	105	89	310	28
6E	57	70	62	149	22
6F	53	75	63	214	18
6K*	34	39	31	166	11

Note: The NAAQS' are: 75 annual geometric mean - 260 maximum 24-hour.

* Discontinued in August, 1975

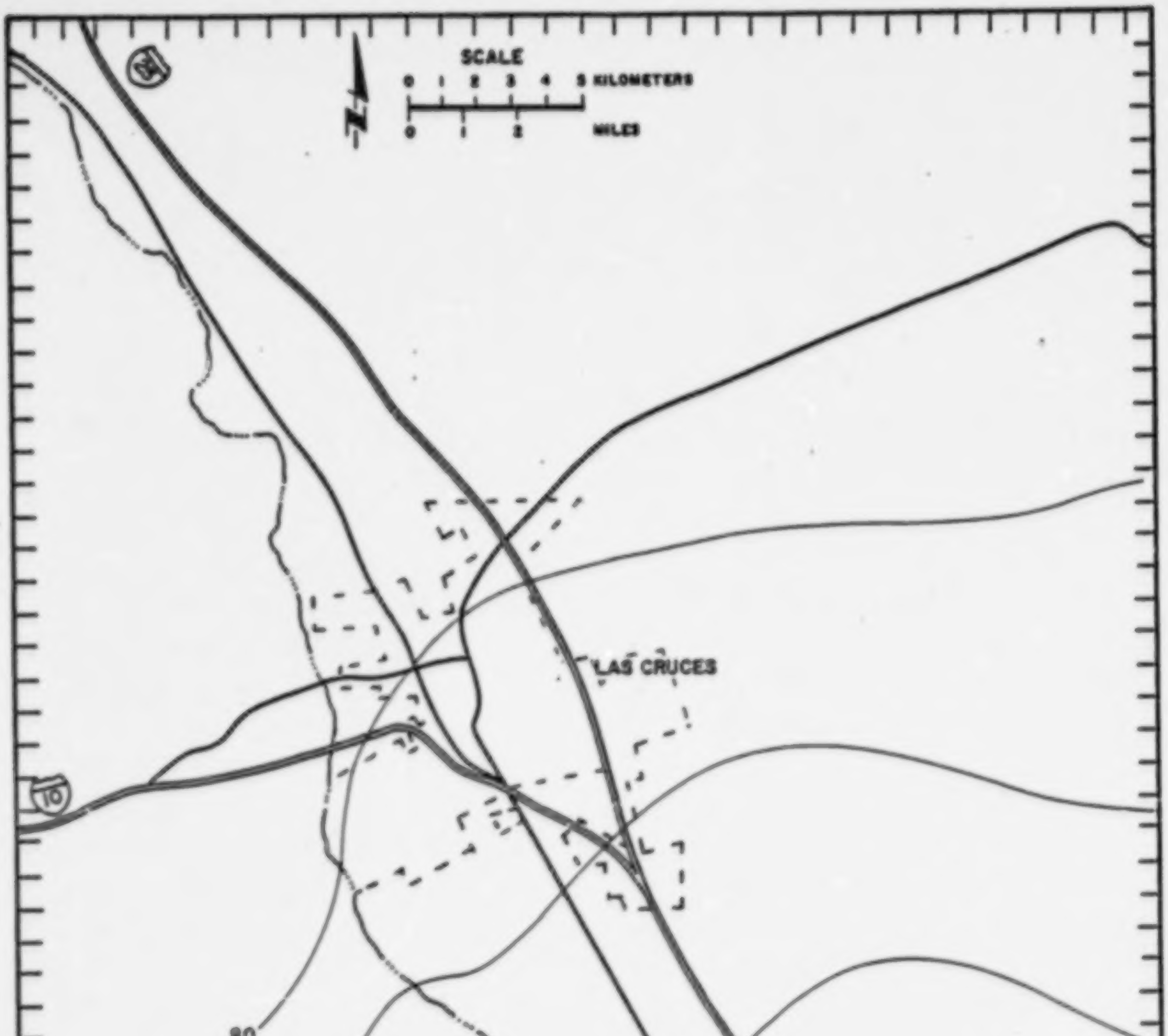

SCALE
0 1 2 3 4 5 KILOMETERS
0 1 2 MILES
N
LAS CRUCES
10
80
90
100
110
70

FIGURE III-25
ANNUAL AVERAGE TSP
CONCENTRATION ($\mu g/m^3$)
DONA ANA COUNTY-1975

The emission inventory for 1978, 1980 and 1985 showed a gradual increase in all source categories. The AQDM calculated increased TSP concentrations through 1985 that represent a 20 percent increase of the annual average TSP over much of the county. Figure III-26 shows the calculated TSP concentrations for 1985. The 24-hour NAAQS is expected to continue to be violated through 1985 and the frequency of violations should increase in all urban areas.

SHORT-TERM DISPERSION MODELING

The EPA's point source model, PTMTP, was run for each of the three counties to determine the short-term impacts of the larger point sources. Each of the larger point source impacts were evaluated using hypothetical "worst-case" meteorology for 24-hours. It was found that no particulate matter point sources in each of the three counties contributed significantly to the levels measured at the monitoring stations.

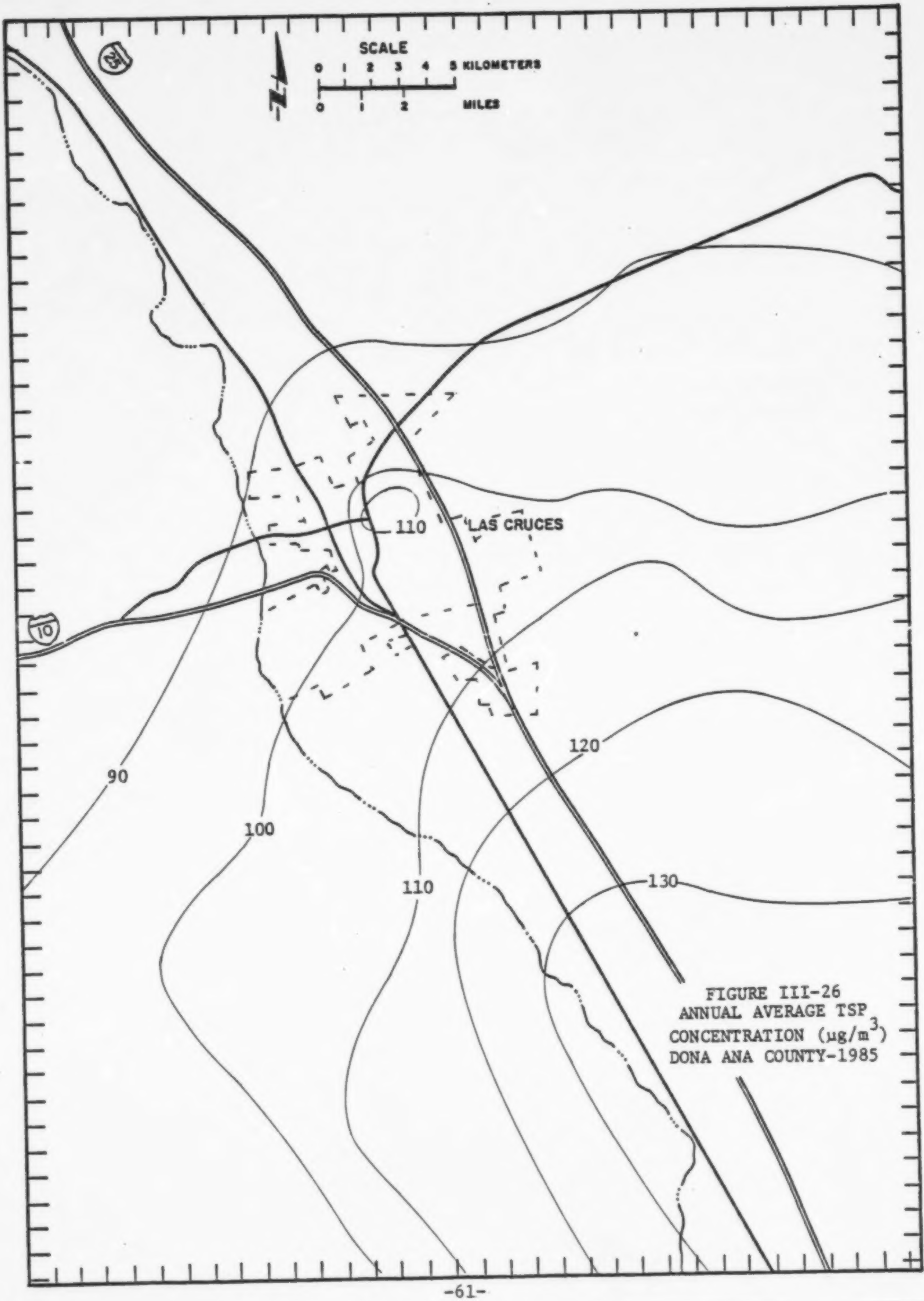

SCALE
0 1 2 3 4 5 KILOMETERS
0 1 2 MILES
N
25
10
LAS CRUCES
90
100
110
110
120
130

FIGURE III-26
ANNUAL AVERAGE TSP
CONCENTRATION ($\mu g/m^3$)
DONA ANA COUNTY-1985

CHAPTER IV

CARBON MONOXIDE CONCENTRATIONS IN BERNALILLO, CHAVES, DONA ANA, SAN JUAN AND SANTA FE COUNTIES

GENERAL

The purpose of this chapter is to discuss the carbon monoxide evaluation in the five counties. The study included: the development of 1975, 1978, 1980 and 1985 line source emission inventories as discussed in Chapter II; a site evaluation of each monitor; a trend analysis of 1975 CO and traffic data; a validation attempt for the APRAC-1A diffusion model in Bernalillo County; and the application of the APRAC-1A to the other four counties.

An air quality trend analysis as required for designating an Air Quality Maintenance Area (AQMA) is, of course, only as sound as its original data base. The data base for CO concentrations, traffic flow, and meteorology in Bernalillo County far exceeds the data available in the other four counties. For this reason, the majority of effort was focused in Bernalillo County with the intention of applying that information to the other four counties. The validation attempt of the APRAC-1A was conducted for Bernalillo County and was not attempted for the other counties. The following sections will discuss the CO trends by county and will discuss the validation attempt of the APRAC-1A in Bernalillo County.

BERNALILLO COUNTY

The CO air quality trends for 1975 were evaluated in detail for Bernalillo County to gain a better understanding prior to the APRAC-1A dispersion model validation effort. The CO concentration trends versus traffic flow on major roadways were considered in order to select several peak periods for model validation. Care was taken to ensure that the days selected for model validation were those for which all monitors measured high concentrations.

During 1975 there were four CO monitors in operation in Bernalillo County located as shown in Figure IV-1. Station 2E is located downtown

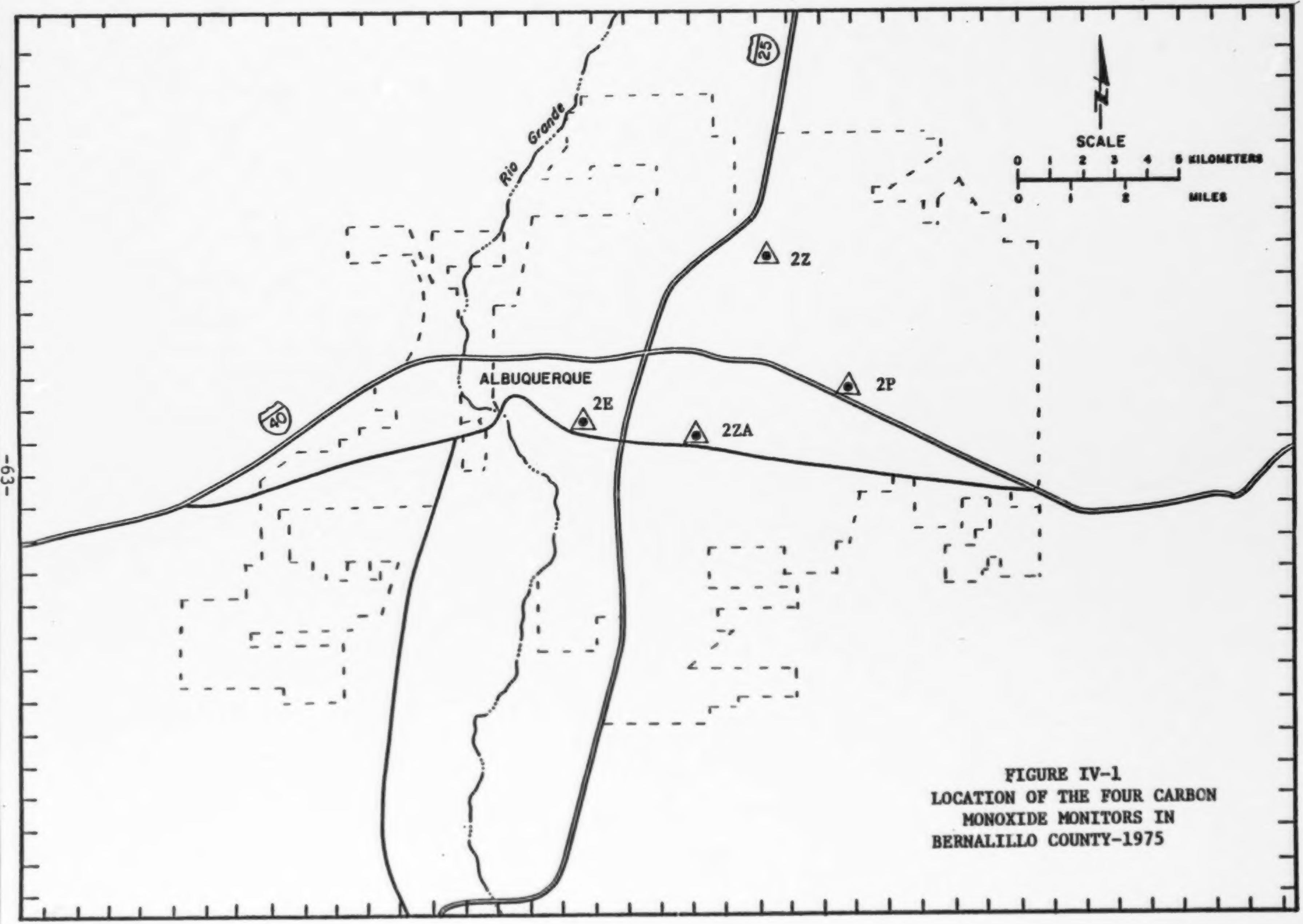

SCALE
0 1 2 3 4 5 KILOMETERS
0 1 2 MILES
25
40
Rio Grande
ALBUQUERQUE
2Z
2P
2E
2ZA

FIGURE IV-1
LOCATION OF THE FOUR CARBON
MONOXIDE MONITORS IN
BERNALILLO COUNTY-1975

Albuquerque near the City Hall in a park, approximately fifty feet from the nearest street. This station is definitely influenced by the local streets and the canyon effects of the taller buildings.

Station 2ZA is located at the intersection of two major traffic corridors, University Avenue and Central. It is approximately 150 feet north from the median of Central and approximately 350 feet east of the median of University. It is on top of Hodgin Hall and is approximately fifty feet above street level and is slightly masked by trees. This station is significantly influenced by University and Central but should be representative of the general area.

Station 2Z is located in a back parking lot of a major shopping center (Montgomery Plaza). It is at street level and is approximately 280 feet west from the median of San Mateo and approximately 1500 feet north from the median of Montgomery. Both San Mateo and Montgomery are heavily traveled corridors and this monitor is influenced by traffic on these streets.

Station 2P is located on Indian School Road on top of the fire station. It is approximately 130 feet south of the median of Indian School Road and is twelve feet above the street level. This station has measured the highest CO concentrations in New Mexico and the majority of this CO evaluation is concerned with the levels measured at this station. Indian School Road is not a heavily traveled street (7000 vehicles per day) but several major traffic corridors are within one quarter of a mile from the monitor.

The importance of the placement of CO monitors cannot be overstated. The following is an excerpt from Volume 11: Air Quality Monitoring and Data Analysis, Guidelines for Air Quality Maintenance Planning and Analysis, P. 37:

> "In contrast, the distribution of CO across a neighborhood consists of many more areas of peak levels, one at each street or major traffic center, with areas of quite low levels between. On a microscale level, the variability means that one must consider site locations for CO in scales of plus or minus a few

meters, rather than plus or minus thousands of meters as might be the case with SO_2 and particulates. For the same reason, height from the ground of the air inlet is more restrictive than for the other pollutants. It is desirable, however, to sample as close as possible to the breathing zone within practical considerations (i.e., proper exposure, security from vandalism, minimizing surface effects, etc.).

"The strong dependence of carbon monoxide concentration upon distance from its source was illustrated in a recent field survey. In this study, it was found that the concentrations experienced by pedestrians exceeded those measured by the fixed air monitoring station, while concentrations at randomly selected locations throughout the survey grid were less than those at the monitoring station. More specifically, the data indicated that average concentrations determined by the monitor would be reduced to near the urban background level by moving the monitor approximately 200 feet farther back from the street. For peak CO sampling within street canyons, the side of the street which is opposite the side facing the roof-top level winds is more likely to experience the highest concentrations.

"These variations basically require that two alternative locations be selected, one for the one-hour standard to which the pedestrian is exposed and another for the eight-hour standard which better represents the exposure of most individuals. In most cities, the one-hour standard is not violated or likely to be if the eight-hour standard is maintained; therefore, such double monitoring is not normally necessary as long as the urban background level is being adequately monitored. The urban background site for CO should be utilized to measure the maximum area-wide concentrations to which the general population is exposed. Thus, either roof-top or ground-level sampling in urban or suburban areas is recommended. This station should not be adjacent to major thoroughfares (not closer than 50 feet from the street curb) to rule out the influence of localized peaks due to roadway traffic."

As mentioned in the above quotation, the location of the monitor is the variable that determines how the CO values are related to the standards. The four monitors located in Bernalillo County could be considered to represent maximum urban CO concentrations. Correlation of the reported eight-hour concentrations to the eight-hour National Ambient Air Quality Standard (NAAQS) may not be advisable without recognition that the general population is not exposed to those levels.

Figure IV-2 shows the percent data collection for the year from the four monitors. As shown, the lowest month was May with only 42 percent and the highest month was December with 82 percent collection reported. Only two months were above 75 percent data collection: November and December. Historically, the winter months have recorded the highest CO concentrations and therefore the low data collection for the summer months should not alter the general trend analysis.

Figure IV-3 shows the number of eight-hour and one-hour reported violations of the NAAQS for each month. January and November each had 35 recorded violations of the eight-hour standard. November had ten reported one-hour violations while February (the next highest month) had four one-hour violations reported. The "CO problem" seems much less noticeable if it is remembered that the stations represent one-hour exposures better than they represent eight-hour exposures.

Figure IV-4 is a plot of the average CO concentration by hour of the day for each month for the Indian School Road monitor. As mentioned above, that monitor experienced by far the highest concentrations during the year. Figure IV-4 is given to show the general diurnal patterns of the CO concentrations. It can be easily seen that a significant amount of CO is present during the night. Only for a few months during the year did the daytime CO levels at any station exceed the levels at night. This trend is observed for the summer as well as the winter months at all four monitoring sites.

FIGURE IV-2
PERCENT DATA COLLECTION OF CO
BERNALILLO COUNTY, 1975

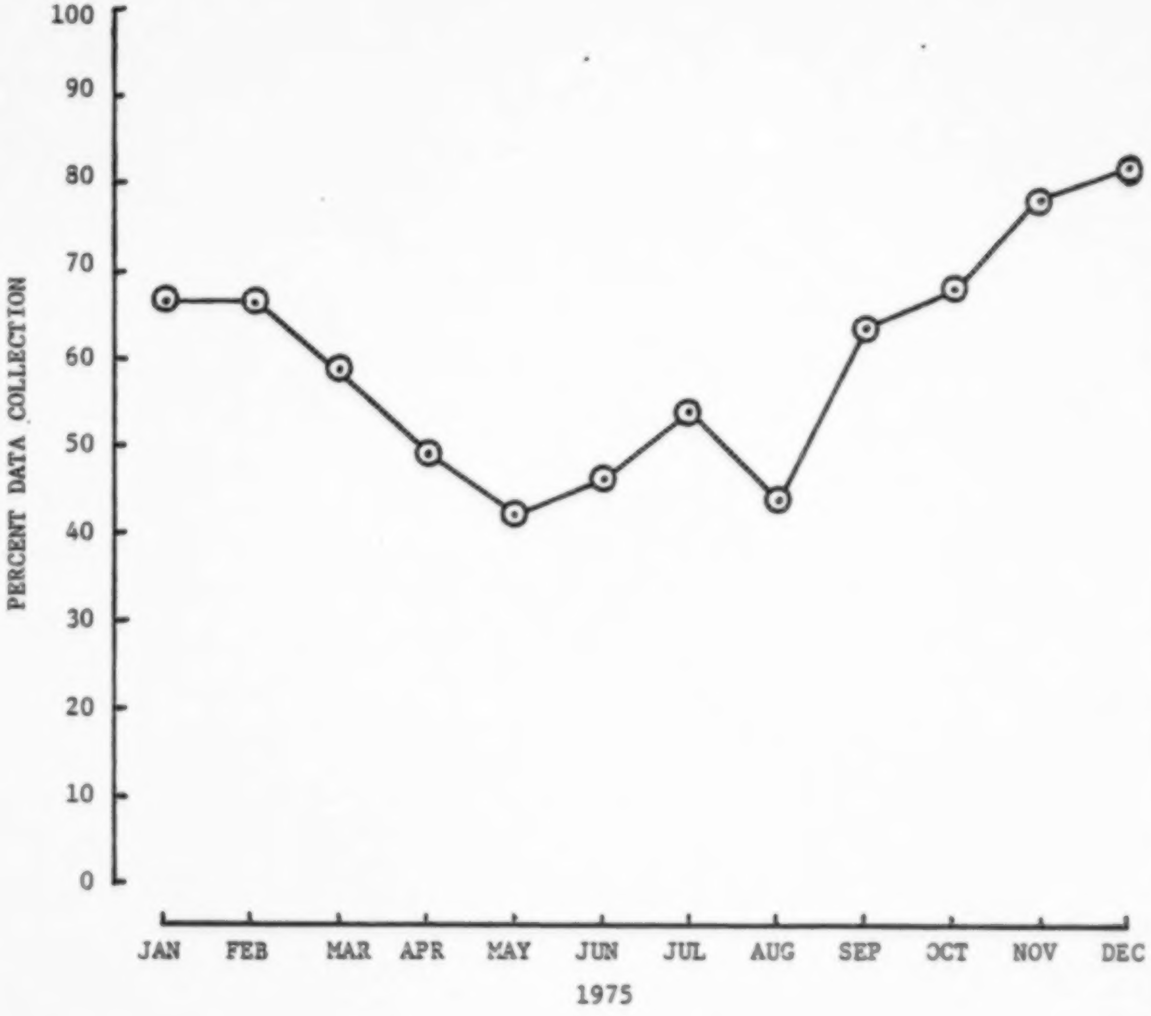


FIGURE IV-3
NUMBER OF REPORTED NAAQS VIOLATIONS
FOR BERNALILLO COUNTY, 1975

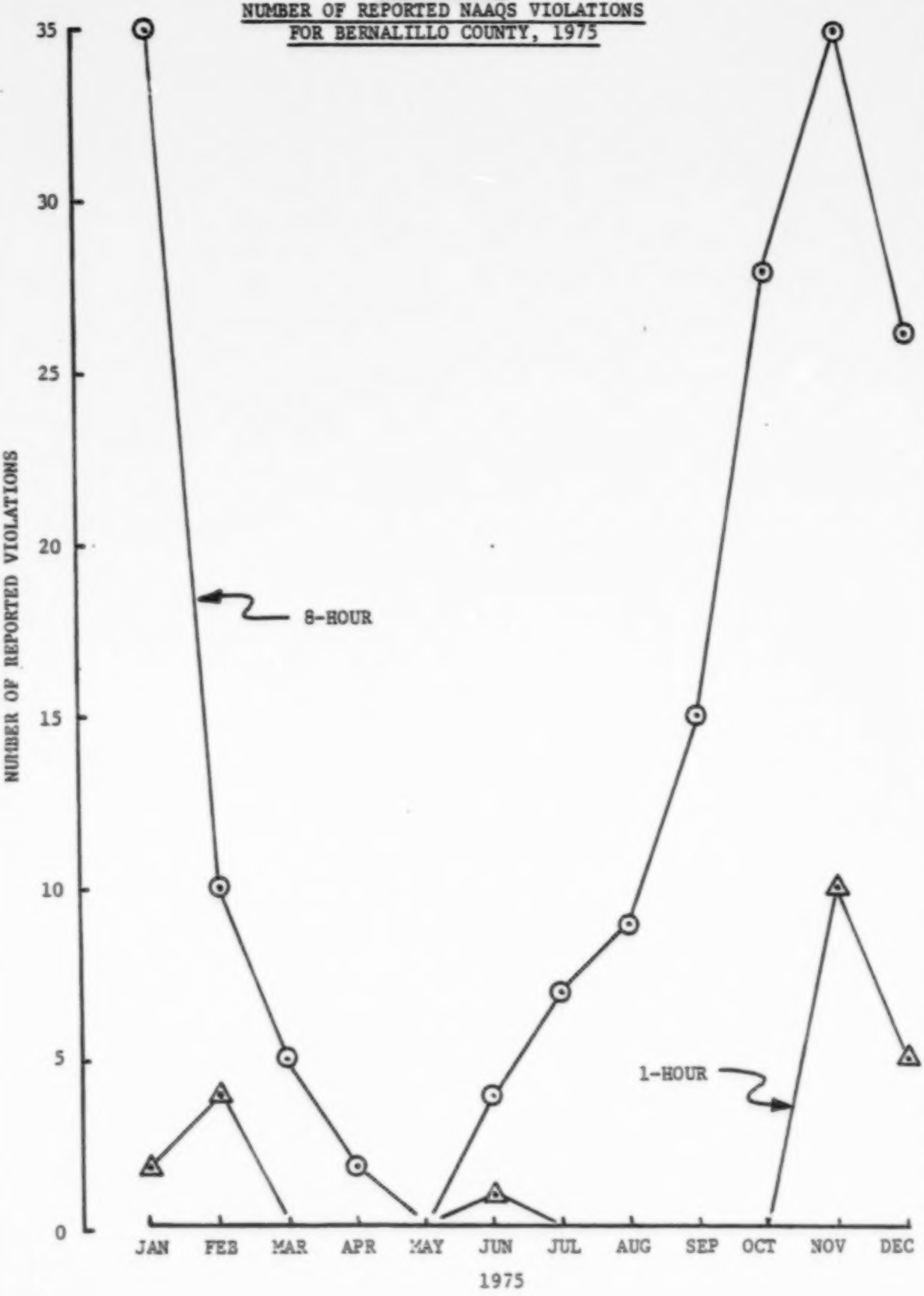


FIGURE IV-4 CO VERSUS "HOUR OF THE DAY" FOR THE INDIAN SCHOOL ROAD SITE

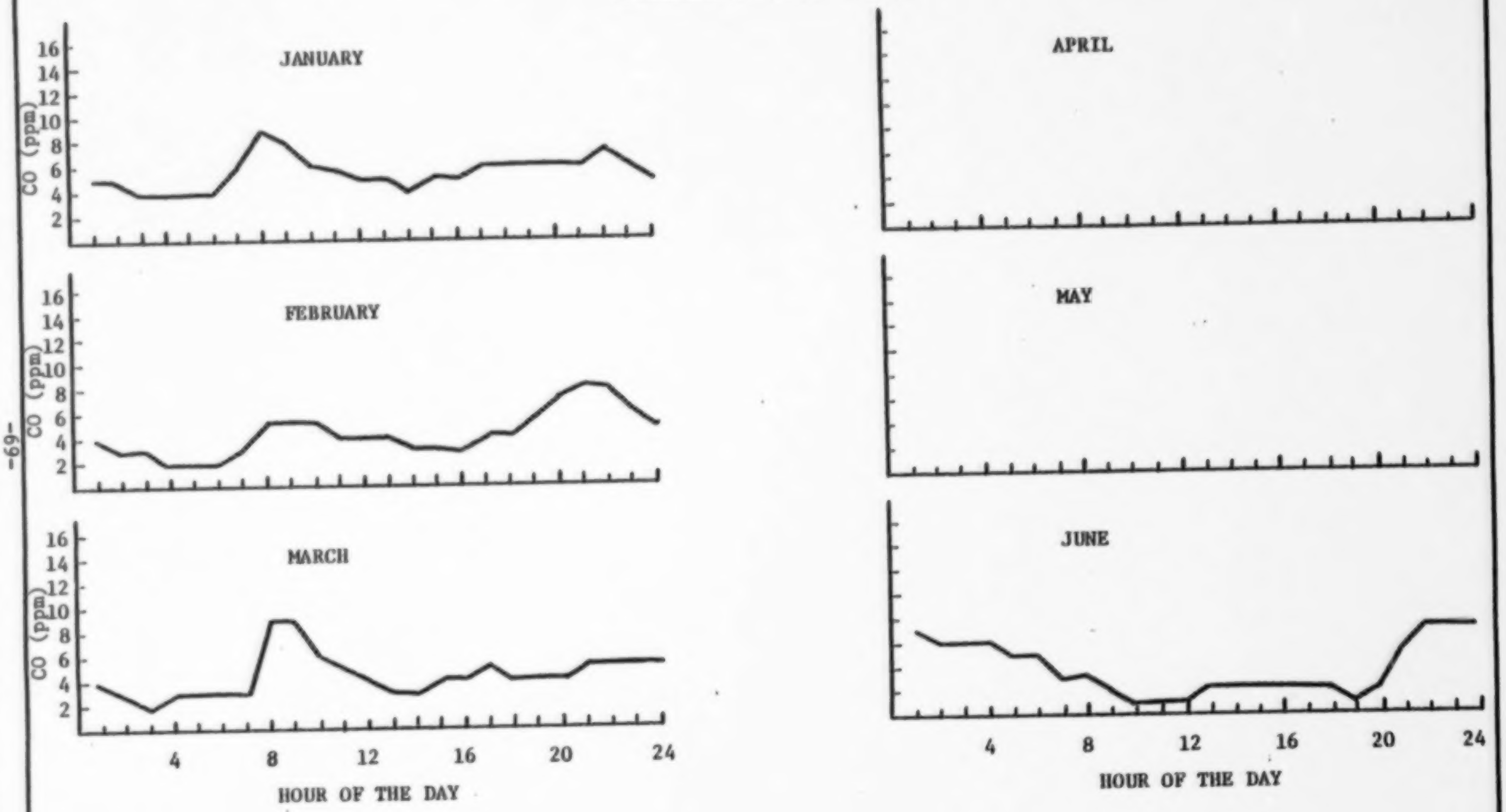


FIGURE IV-4 CONTINUED

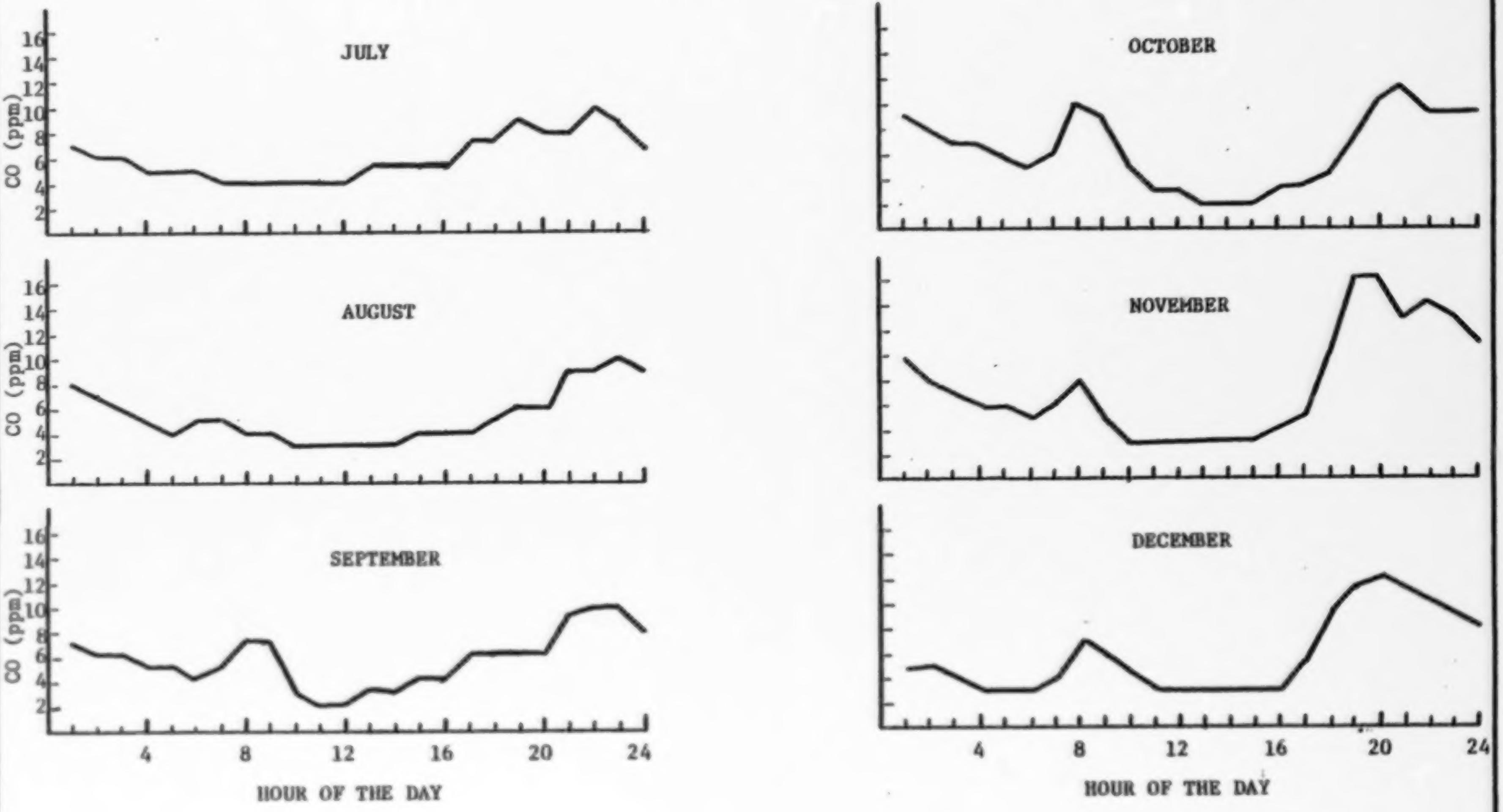


Figure IV-5 shows the distribution of the maximum daily average CO concentration for each site during each month. The Indian School Road monitor experienced a daily average CO level in November of 15 ppm which is almost two times the eight-hour standard of 9 ppm. Figure IV-6 is a similar plot as Figure IV-5 except that the maximum one-hour concentration for each month is plotted. As shown, violations of the one-hour standard were recorded in January, February, November and December. The maximum one-hour value reported was 45 ppm and was reached both in February and November at the Indian School Road site.

Based on the trends indicated from the above mentioned figures, the month of November was chosen as the "validation period" for the APRAC-1A. As was shown in Chapter III, the TSP levels were also very high during November and this was another consideration in selecting November.

Figure IV-7 shows the average CO concentration for each monitoring station during November. The fifth, seventh and fourteenth were peak days for all stations. All four monitors were operating during these peak days. Figure IV-8 shows the maximum hourly CO levels for each station during November. As shown, the one-hour standard was violated on November 5, 7, and 14.

For the purposes of model validation and for forecasting "worst-case" CO levels, it is important to select validation time periods which show high CO levels over the entire study area rather than just one small area. It is apparent from Figures IV-7 and IV-8 that the CO problem on November 5, 7, and 14 was city-wide, not just a local occurrence.

The hourly CO levels from November 2 through November 15 were evaluated for each station. The levels tended to rise and fall during the same time periods for each station which indicated a large area of influence. Upon this evaluation, the days November 3 through 7 and November 12 through 15 were selected as target days for the validation of the APRAC model.

FIGURE IV-5
MAXIMUM 24-HOUR AVERAGE CO CONCENTRATION MEASURED DURING THE MONTH BERNALILLO COUNTY, 1975

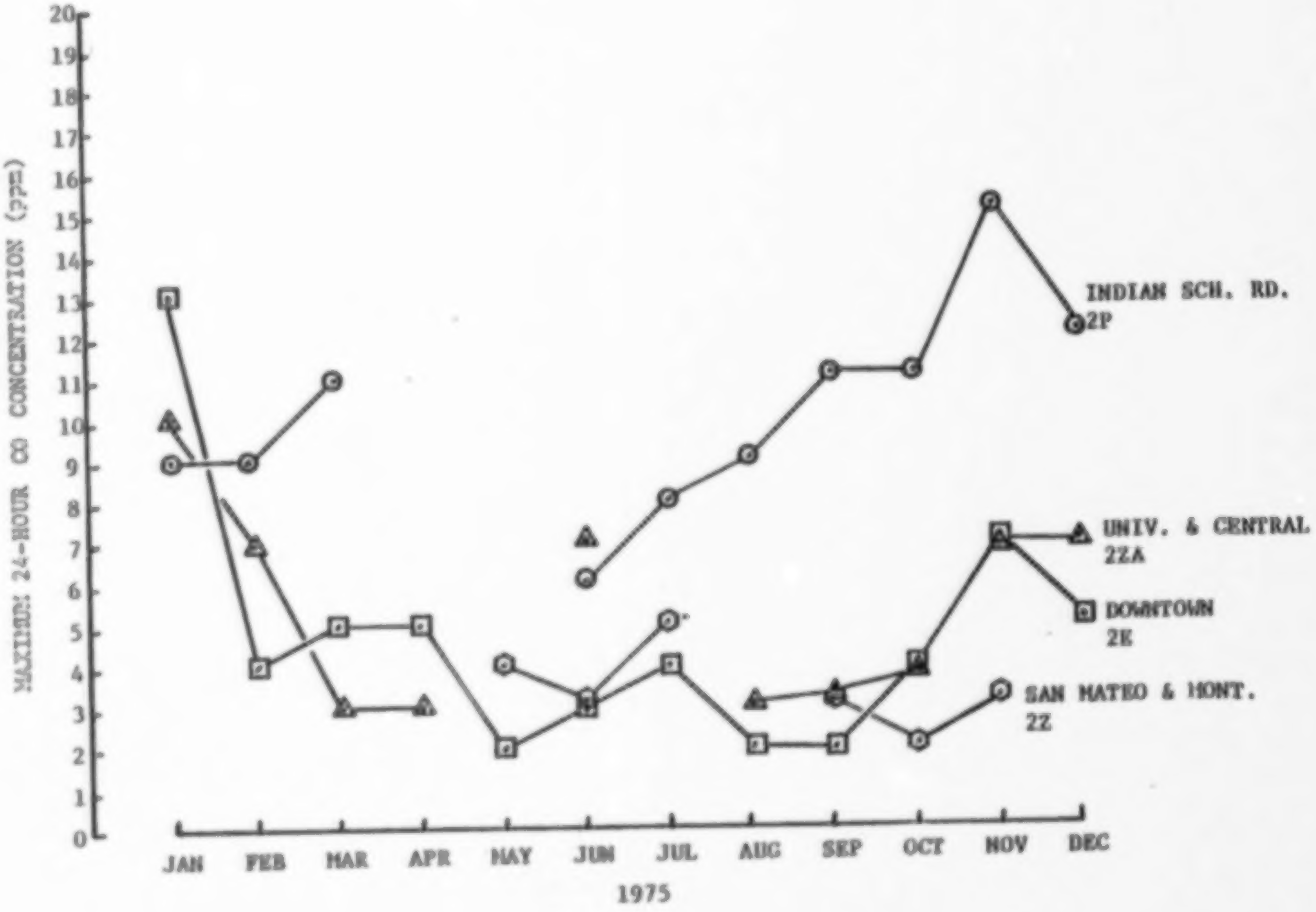


FIGURE IV-6 MAXIMUM 1-HOUR CO CONCENTRATION (ppm)
MEASURED DURING THE MONTH

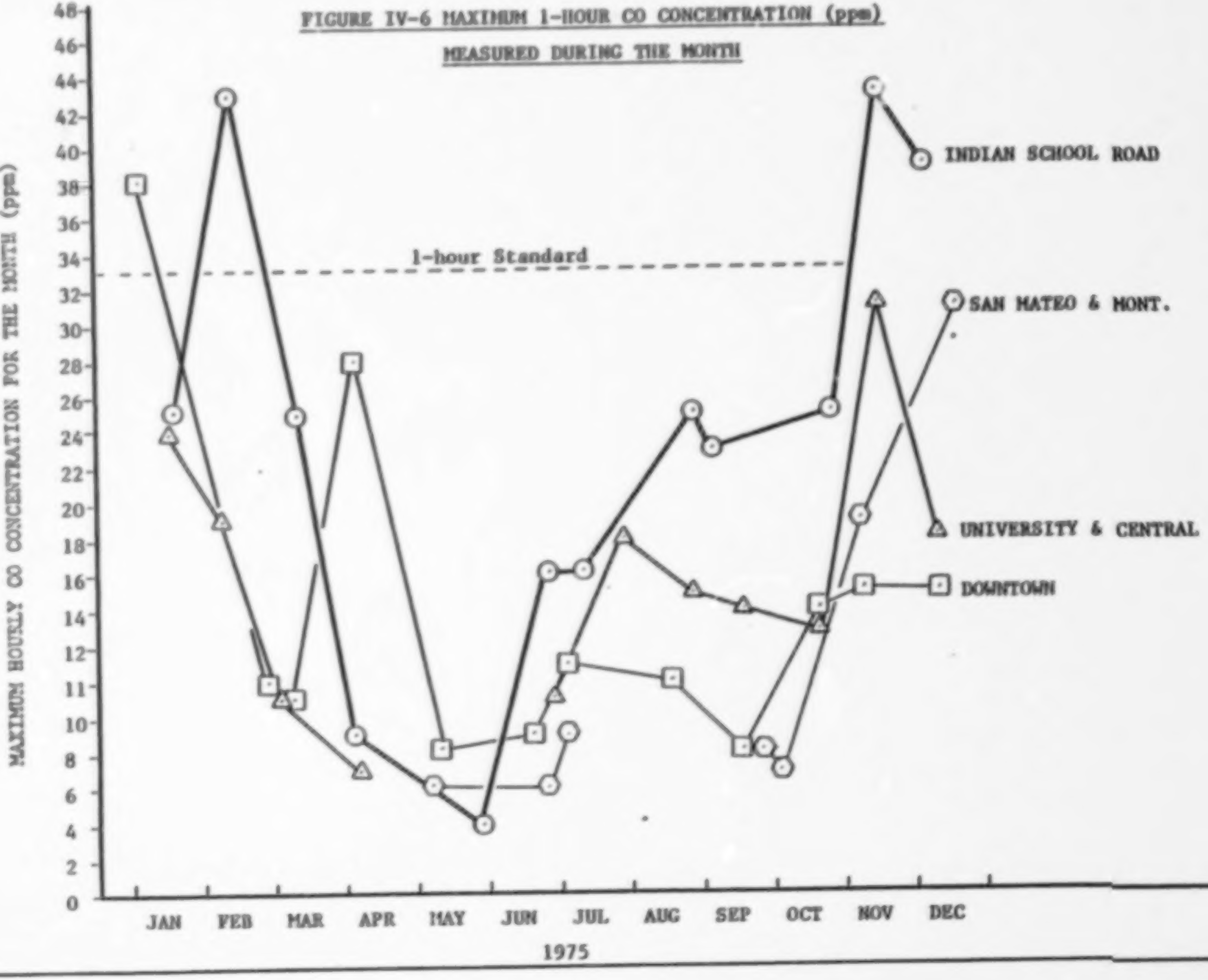
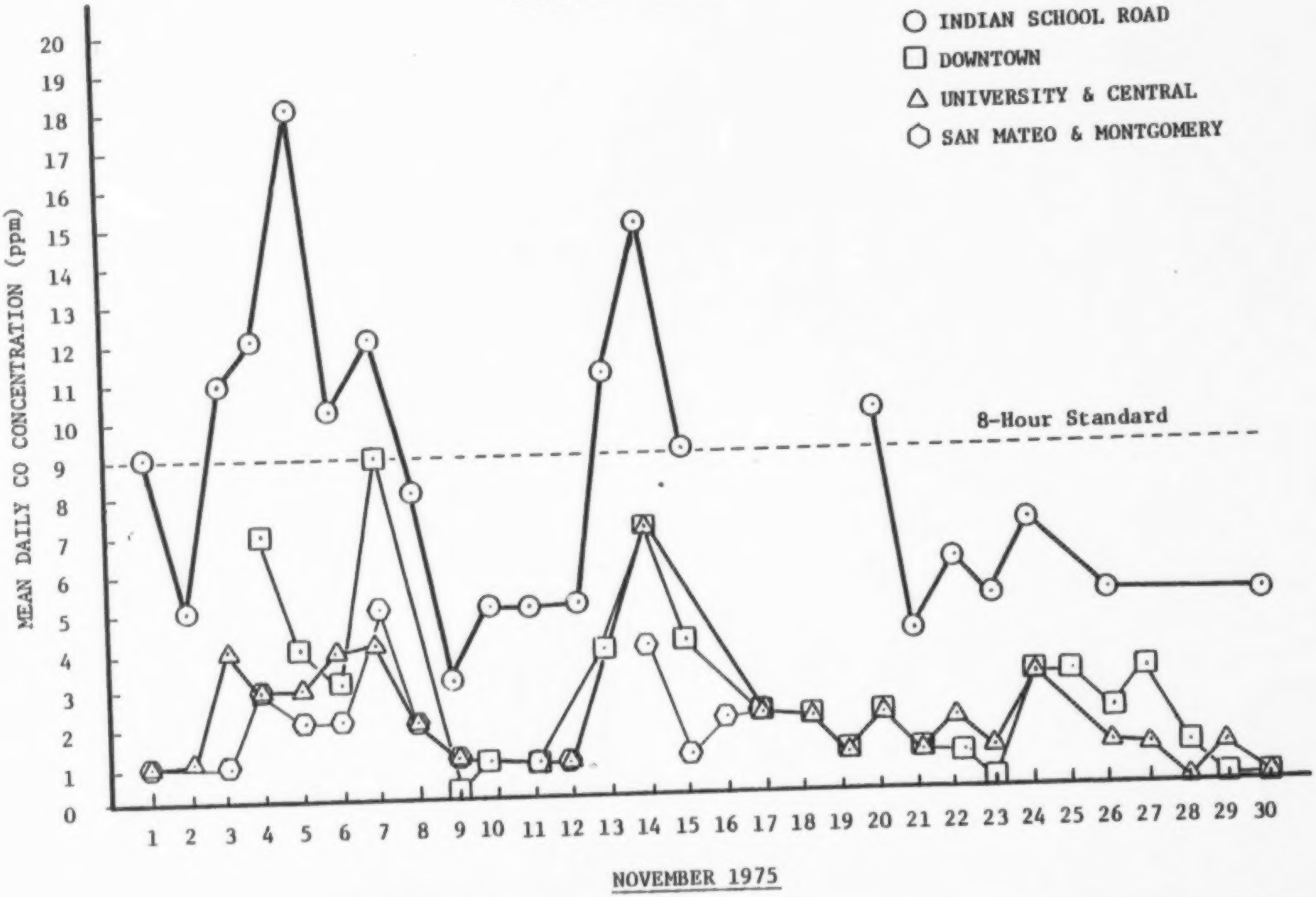


FIGURE IV-7 DAILY CO CONCENTRATIONS (ppm)

DURING NOVEMBER



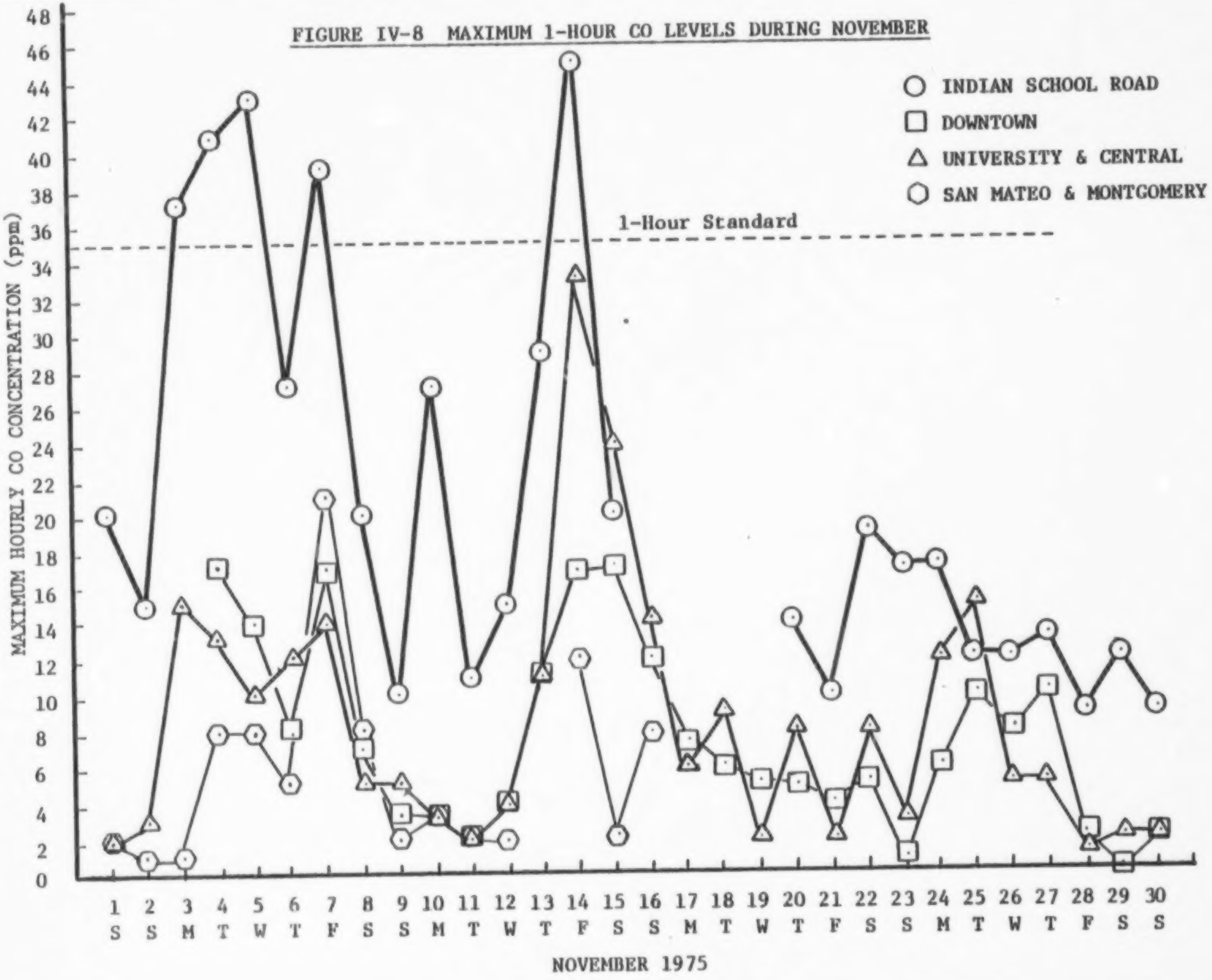


FIGURE IV-8 MAXIMUM 1-HOUR CO LEVELS DURING NOVEMBER

The traffic flow was monitored at three permanent sites during 1975. The monthly, daily and diurnal variations were evaluated for each month. The highest traffic month was October, the typical worst day was Friday and the typical worst hour was 4:00 p.m. to 5:00 p.m. Figure IV-9 shows the total daily traffic flow for each of the three traffic monitors during November 1975. As shown, the days selected for the model validation are typical traffic days, not gross abnormalities. Figure IV-10 shows the diurnal variation in traffic flow for each traffic monitor during the month of November. All days during the month were considered. The traffic peaked at each station during the hour 4:00 p.m. to 5:00 p.m.

The diurnal variation shown in Figure IV-10 for November is representative of any month during 1975 at most streets throughout New Mexico. In order to gain a better understanding between the maximum CO levels and traffic volume, an annual diurnal variation plot for CO was prepared. Figure IV-11 shows the diurnal variation for the second highest hourly CO level. That is, the plotted CO level is the second highest measured during the year for a particular hour of the day. The first highest was not plotted since a trend was desired, not the abnormalities that may cause a higher reading. The general traffic flow for I-25 and San Mateo are also plotted in Figure IV-11. As shown, the CO concentrations generally peak three to five hours after the traffic has peaked. This fact has serious implications concerning the APRAC model validation. The APRAC calculates CO concentrations hourly based upon hour by hour input information. No "background" CO left from another hour's traffic can be considered.

Prior to discussing the validation attempt of the APRAC-1A, it is interesting to note that the interpretation of the CO data is very important. As mentioned earlier, the location of the monitors influence the interpretation and as will be shown below, the standard time averaging also significantly affects the interpretation.

Approximately 80 percent of the possible data were collected at the Indian School Road monitor during November. A log-probability plot was made of the November hourly CO concentrations as shown in Figure IV-12. The data tend to fit a straight line except for the upper percentiles.

FIGURE IV-9 DAILY TRAFFIC FLOW AT THREE SITES

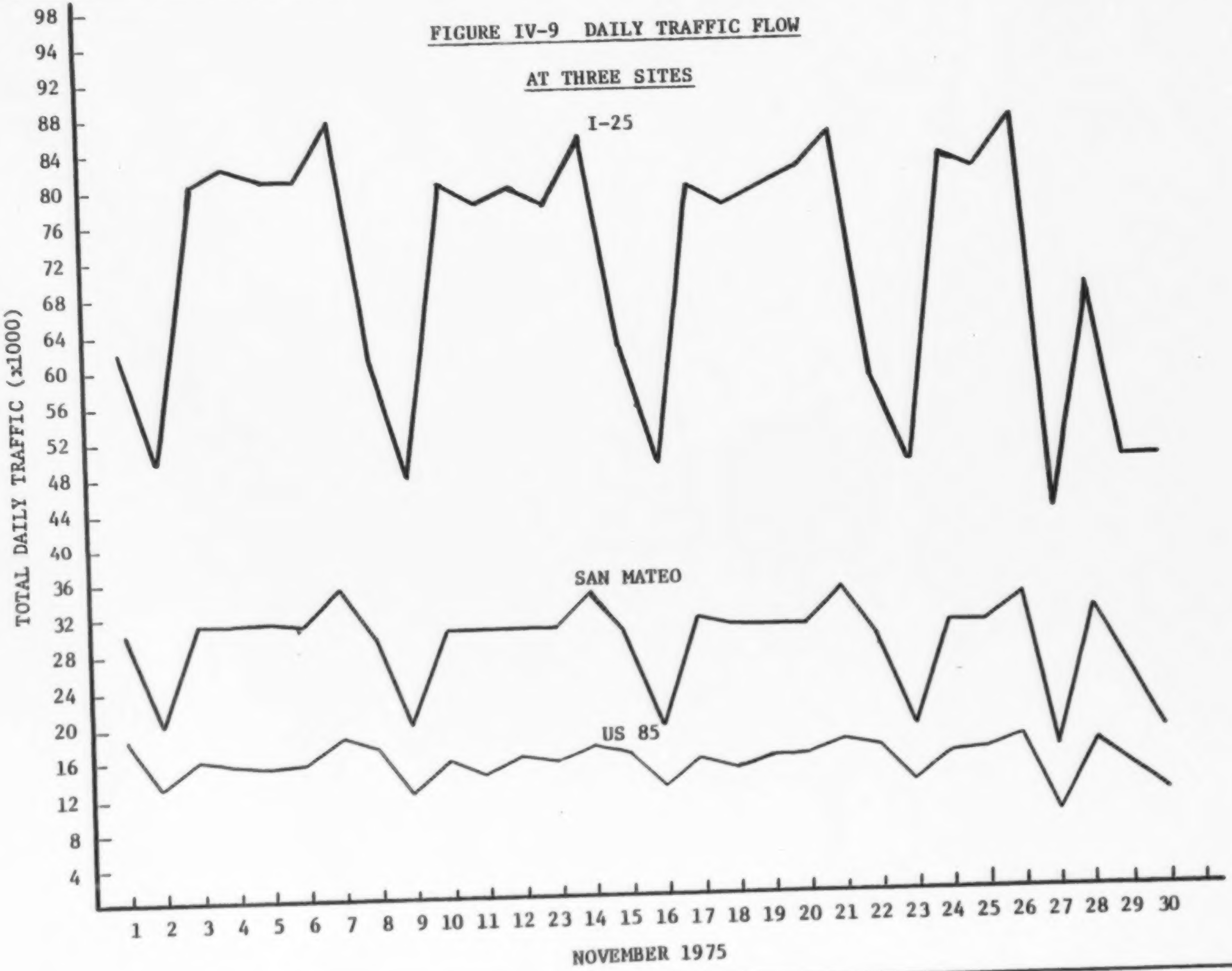


FIGURE IV-10 DIURNAL TRAFFIC PATTERN DURING NOVEMBER, 1975

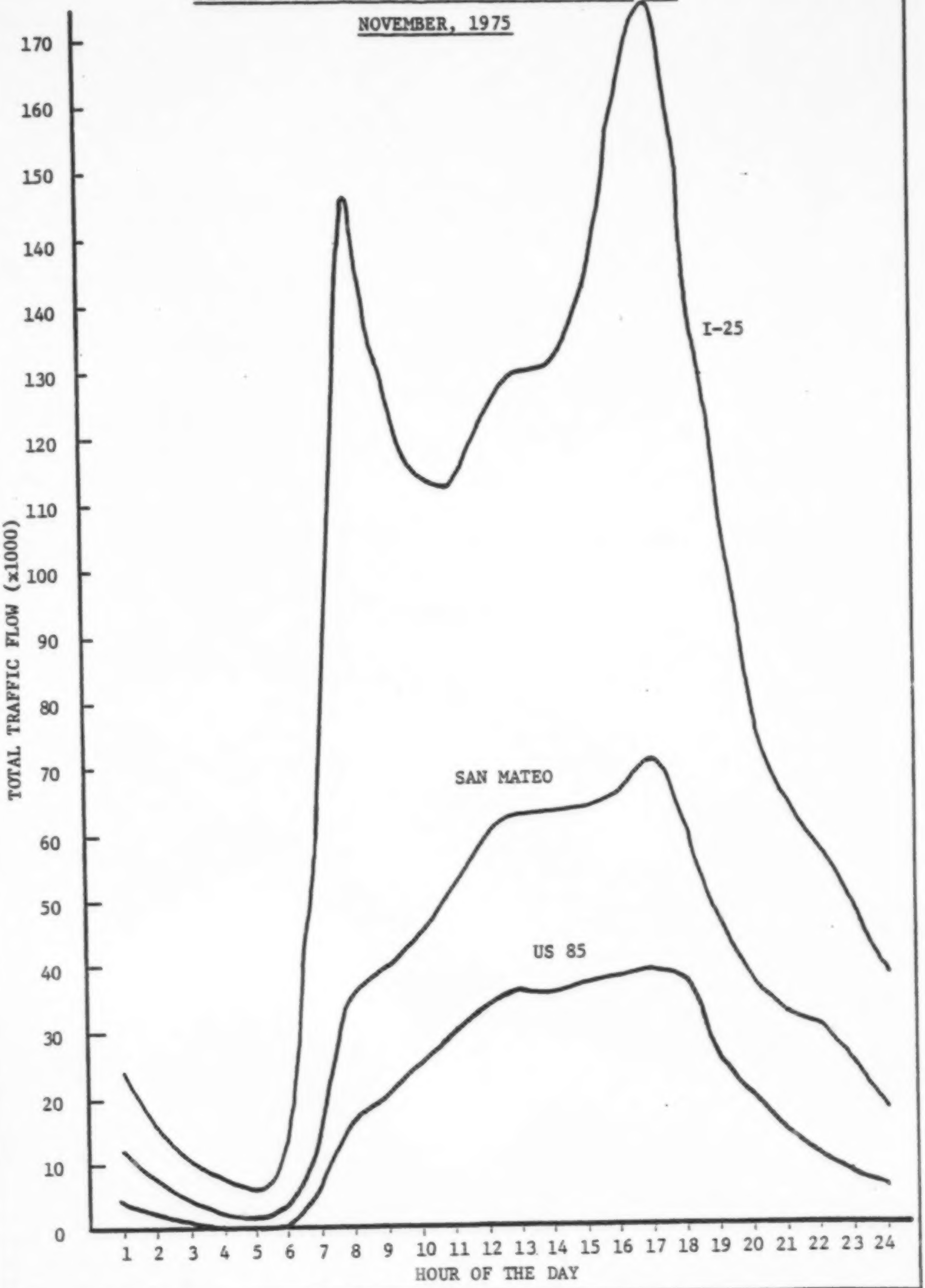
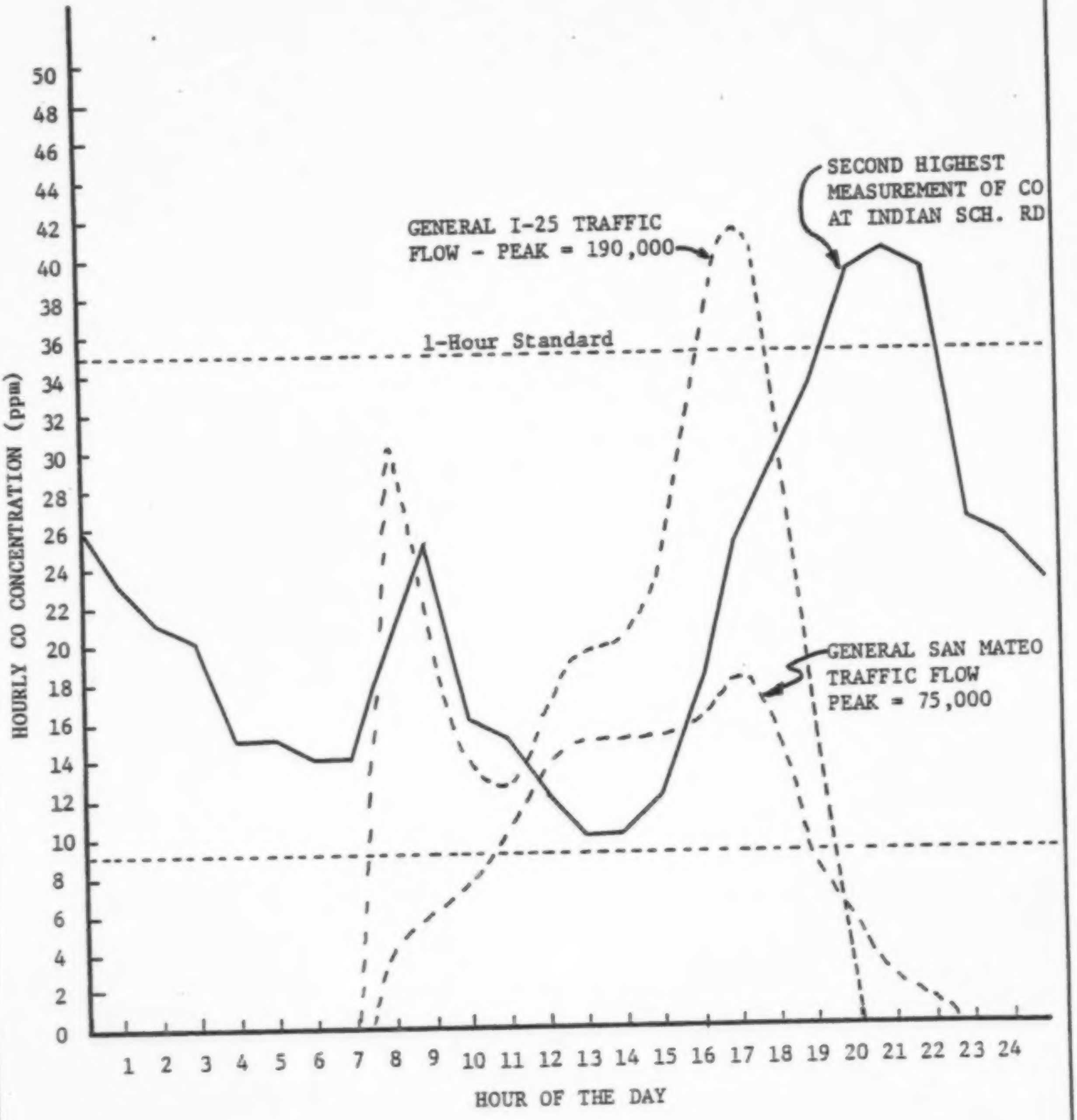


FIGURE IV-11 DIURNAL CO CONCENTRATIONS (ppm)

FOR 1975



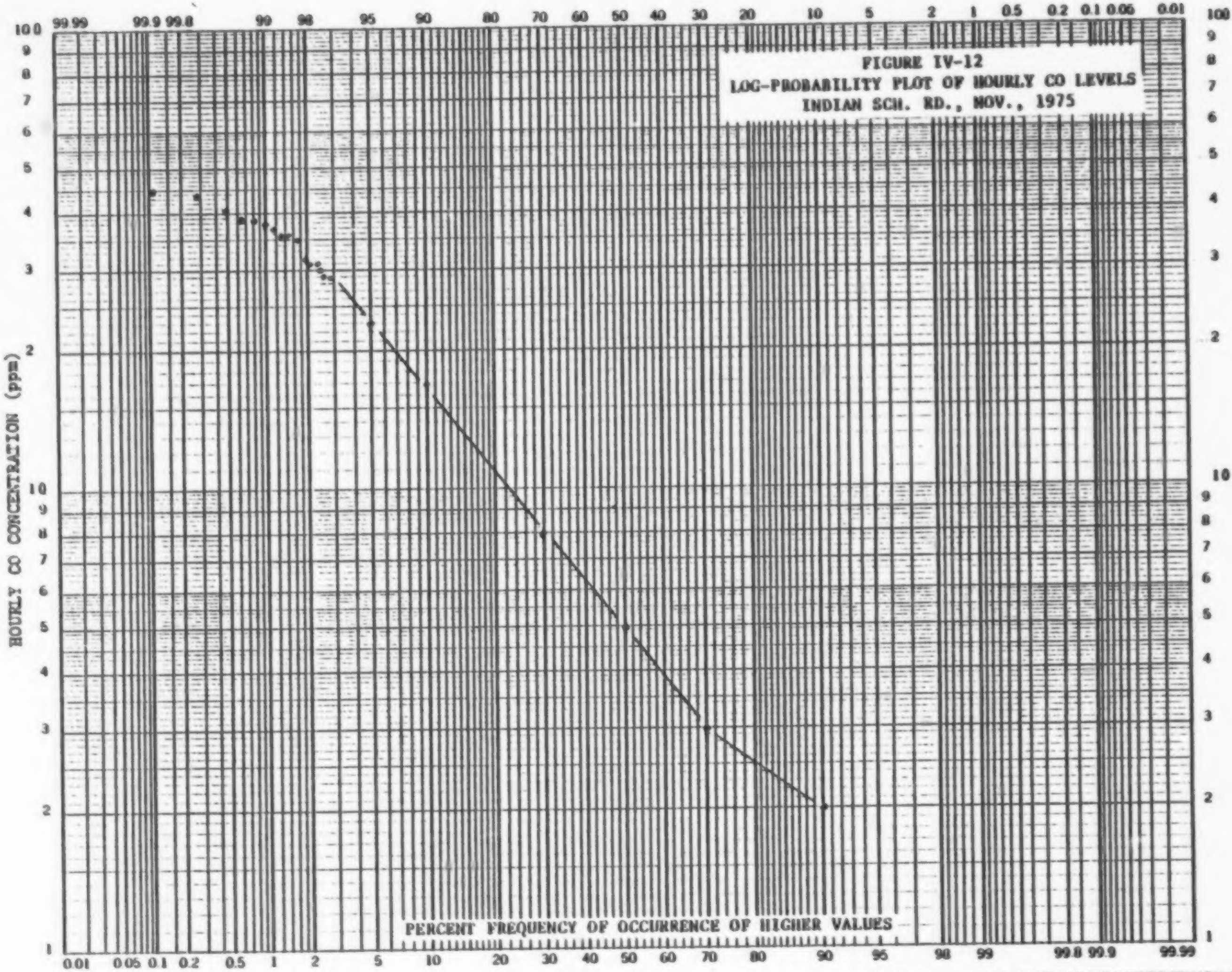


FIGURE IV-12
LOG-PROBABILITY PLOT OF HOURLY CO LEVELS
INDIAN SCH. RD., NOV., 1975

If the general trend of the first 97 percentile extended through the highest hour then the maximum hourly reading would have been 90 ppm not 45 ppm as was actually reported. The decreasing slope for the higher percentiles may be a result of the air quality simply not following the log-normal distrubution or it may result from the errors inherent in reporting the data. That is, the data are reported on a routine basis as twenty-four hourly concentrations starting with midnight to 1:00 a.m., 1:00 a.m. to 2:00 a.m., ... 11:00 p.m. to midnight, etc. It is entirely possible (perhaps probable) that the maximum hourly concentration occurred during a different hour time span. For example, it is conceivable that the maximum hourly concentration could have occurred from half past one hour to half past the next hour.

This line of thought becomes even more apparent when the eight-hour average concentrations are considered. There are eight different non-overlapping cycles for eight-hour averages: i.e., start at 12 midnight to 8:00 a.m., or 1:00 a.m. to 9:00 a.m. or 2:00 a.m. to 10:00 a.m., etc. The eight different cycles were calculated for the Indian School station for November. Table IV-1 lists the five highest concentrations for the different cycles. As can be seen, the cycle beginning at 2:00 a.m. will give much higher eight-hour concentrations than the cycle beginning at 5:00 a.m. A control strategy based on 30 ppm has much more severe implications than one based upon 20 ppm. The highest and lowest cycles are plotted on log-probability paper as shown in Figure IV-13. The data plotted for the lower cycle (5:00 a.m.) is noticed to curve at the upper percentiles just as was noticed for the one-hour plot. However, the highest cycle (2:00 a.m.) did not curve as sharply. The implications from these plots may mean that if a true "running average" eight-hour concentration was obtained then the maximum concentration could have exceeded 40 ppm. It is interesting to note that the statistical program used by the New Mexico EIA calculated the eight-hour maximum CO concentration to be 24 ppm. The selection of the one-hour and eight-hour cycle is very important and should be carefully considered when interpreting the CO data.

TABLE IV-1

MAXIMUM 8-HOUR CO LEVELS (ppm) ESTIMATED BY VARIOUS STARTING TIMES DURING THE MONTH OF NOVEMBER, 1975 INDIAN SCHOOL ROAD STATION

	CO Concentration (ppm) For Cycles Beginning at							
Rank	Midnight	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.
First	28	30	30	28	24	20	23	25
Second	26	26	27	24	23	20	22	25
Third	24	26	25	21	22	20	22	24
Fourth	23	24	23	20	18	20	20	22
Fifth	23	22	23	18	17	19	18	20

NOTE: The 8-hour NAAOS is 9 ppm.

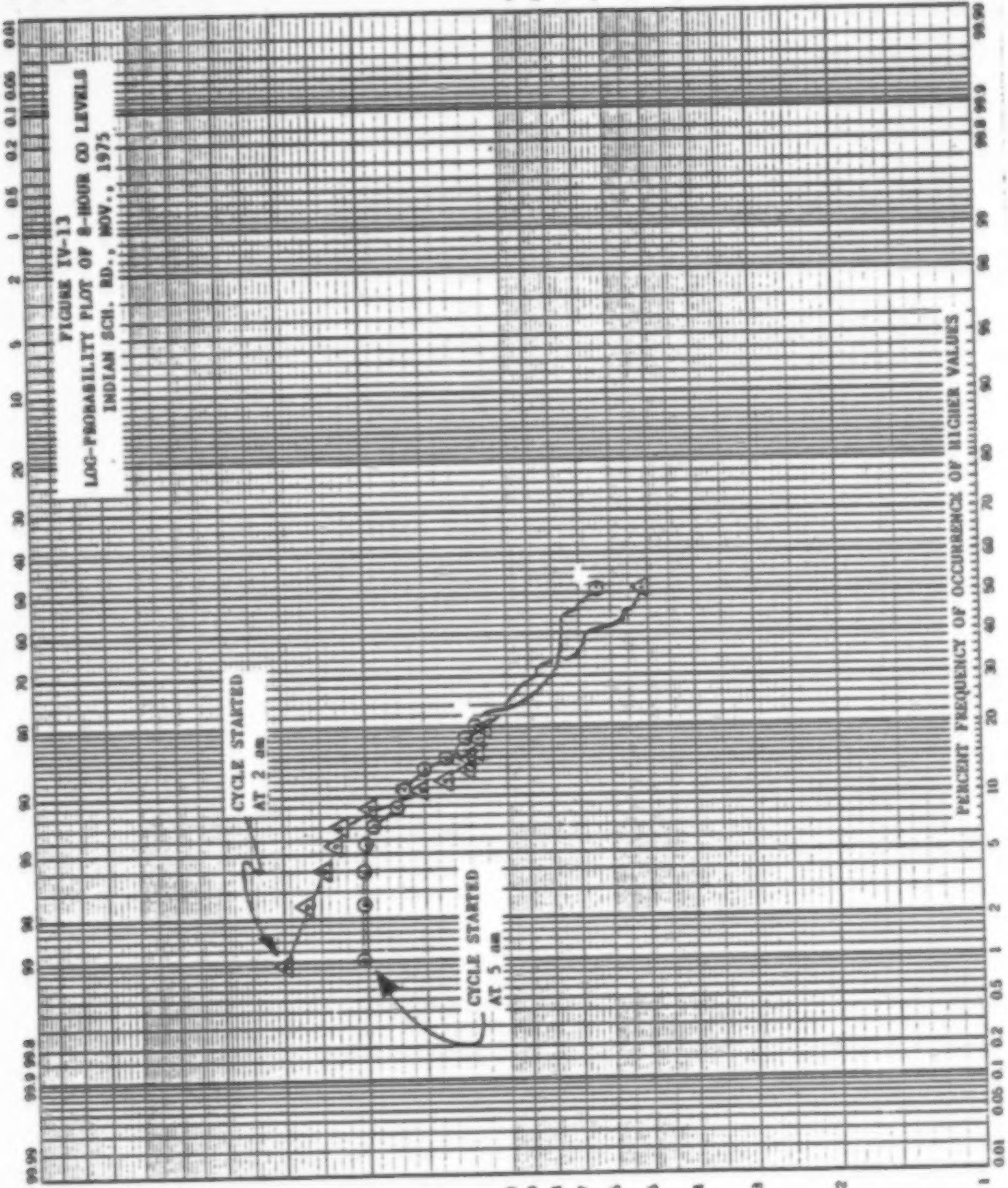


FIGURE IV-13
LOG-PROBABILITY PLOT OF 8-HOUR CO LEVELS
INDIAN SCH. RD., NOV., 1975

As mentioned above, the peak days for November were selected for validating the APRAC-1A. The traffic flow data collected during these days at the three permanent traffic counter sites were used to estimate the hour-by-hour traffic flow for all major traffic corridors. The hour-by-hour meteorological data used in the validation attempt was collected at the Albuquerque International Airport. As discussed in Chapter II, an annual average emission equation was developed based upon AP42. The specific values for parameters of the emission model were changed so as to account for the change in average daily temperature of November compared to the annual average temperature.

Figures IV-14 through IV-22 show the observed hourly CO concentrations for each of the peak days at the Indian School Road stations as well as the CO concentrations calculated by the APRAC-1A. As can be easily seen, the APRAC-1A neither represents the magnitude of the measured CO nor does it represent the general diurnal distribution as measured by the CO monitor. Similar patterns were noticed for the other monitors.

The apparent discrepancy between the observed and calculated values results from the basic assumption in the model possibly not being applicable to the Albuquerque area. Perhaps the terrain effect causes drainage flow not accounted for in the APRAC-1A or perhaps the location of the monitors are influenced by the nearby streets more than has previously been anticipated. Regardless, the APRAC-1A does not adequately represent the CO patterns in Albuquerque and should not be used to estimate future air quality without a much more in-depth evaluation than is provided in this study.

DONA ANA COUNTY

During 1975, there were four sites used for measuring CO concentrations, however, no site collected data for the entire year.

Station No. 6B is located near the Courthouse approximately fifty feet south of the median of Amador Avenue in downtown Las Cruces. The data collected at this site should be interpreted to represent one-hour exposures more adequately than eight-hour exposures. Table IV-2 lists the summary data for station 6B. As shown, the highest one-hour

FIGURE IV-14

CALCULATED AND OBSERVED CARBON MONOXIDE CONCENTRATION NOVEMBER 3, 1975

INDIAN SCHOOL ROAD MONITOR

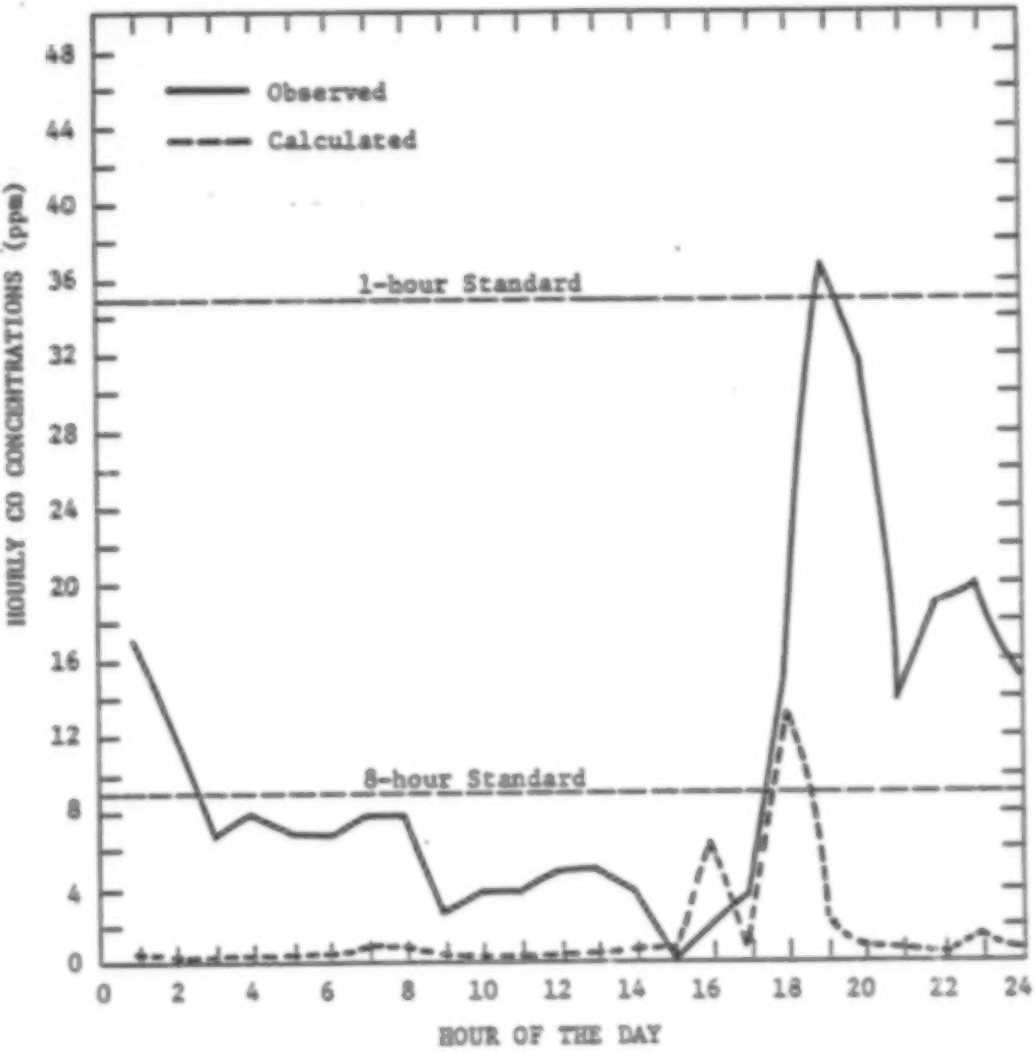


FIGURE IV-15

CALCULATED AND OBSERVED CARBON MONOXIDE CONCENTRATION NOVEMBER 4, 1975

INDIAN SCHOOL ROAD MONITOR

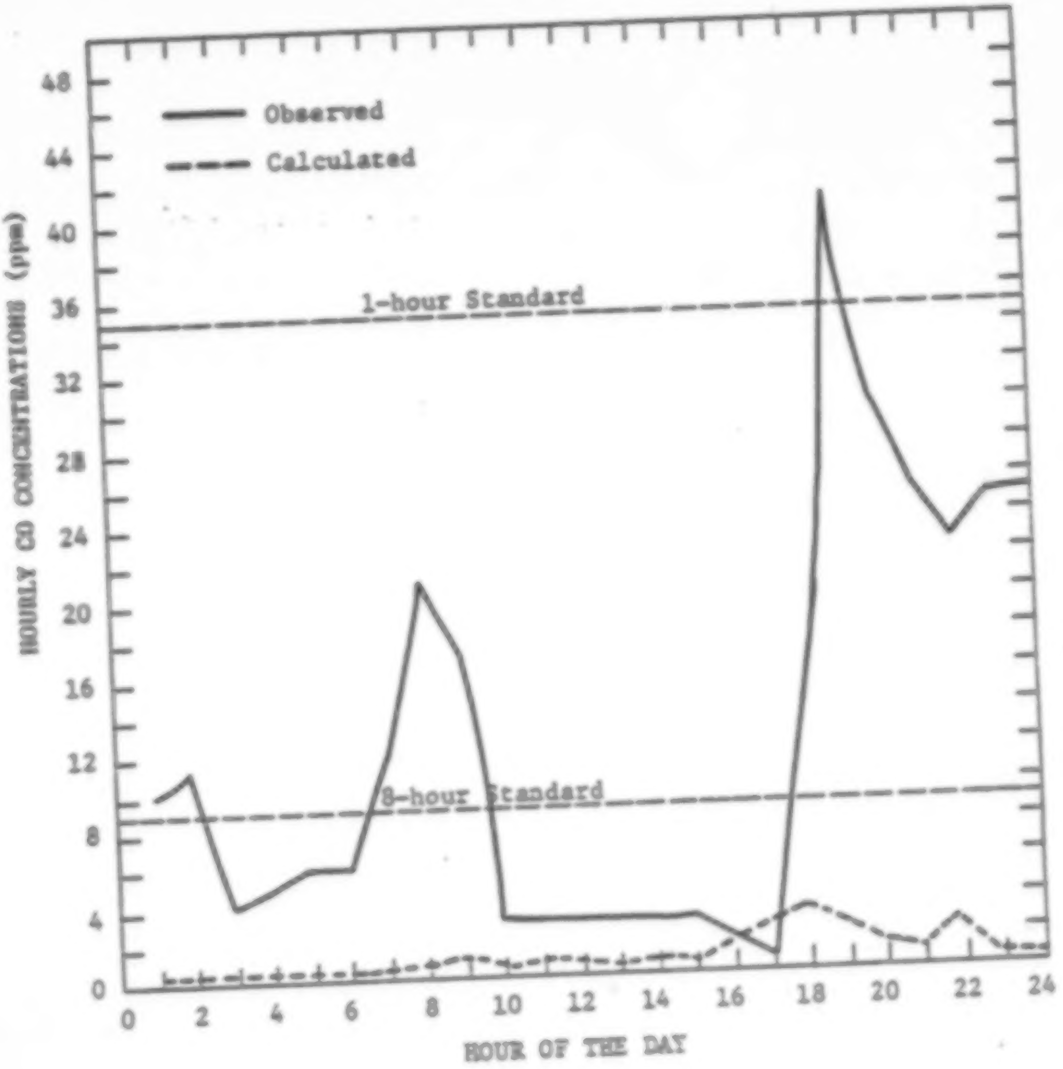


FIGURE IV-16

CALCULATED AND OBSERVED
CARBON MONOXIDE CONCENTRATION
NOVEMBER 5, 1975

INDIAN SCHOOL ROAD MONITOR

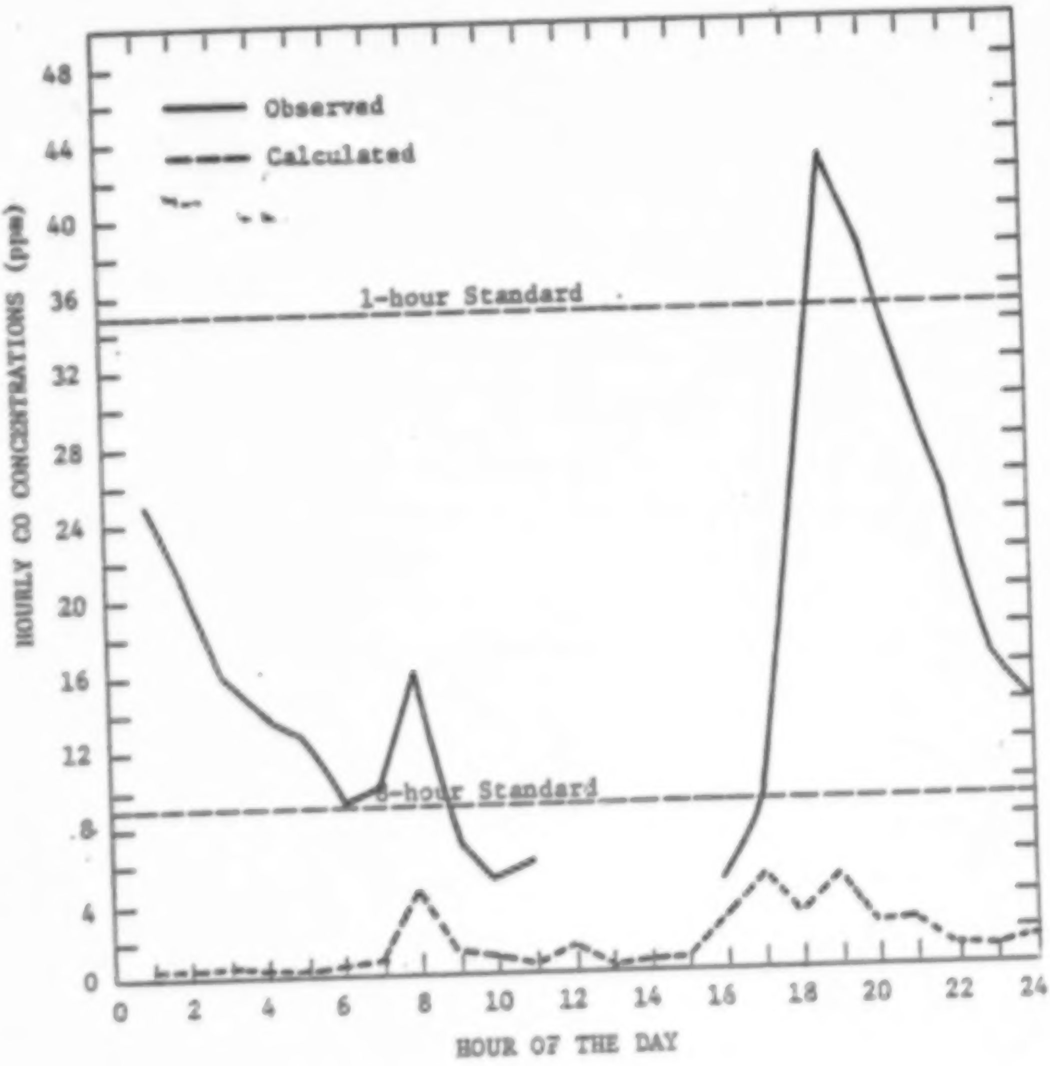


FIGURE IV-17

CALCULATED AND OBSERVED CARBON MONOXIDE CONCENTRATION NOVEMBER 6, 1975

INDIAN SCHOOL ROAD MONITOR

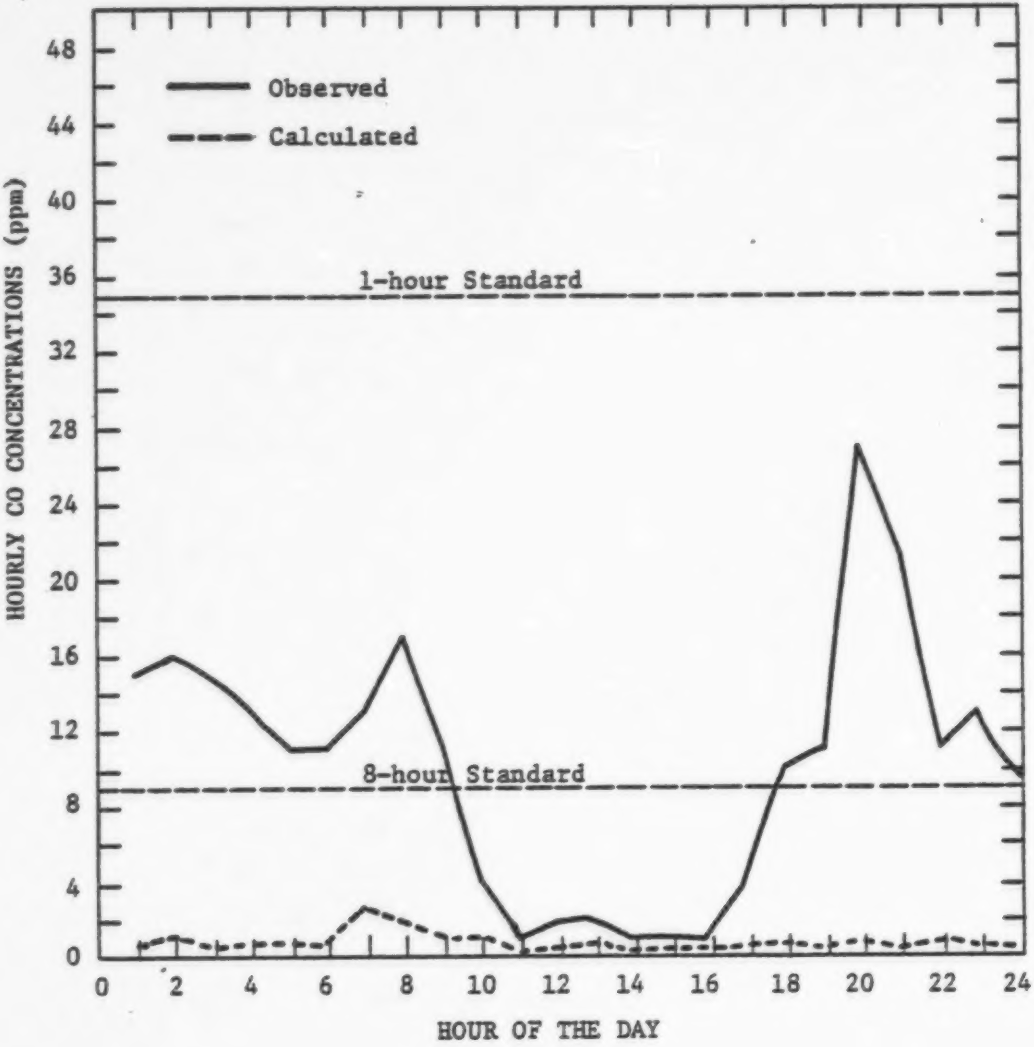


FIGURE IV-18

CALCULATED AND OBSERVED
CARBON MONOXIDE CONCENTRATION
NOVEMBER 7, 1975

INDIAN SCHOOL ROAD MONITOR

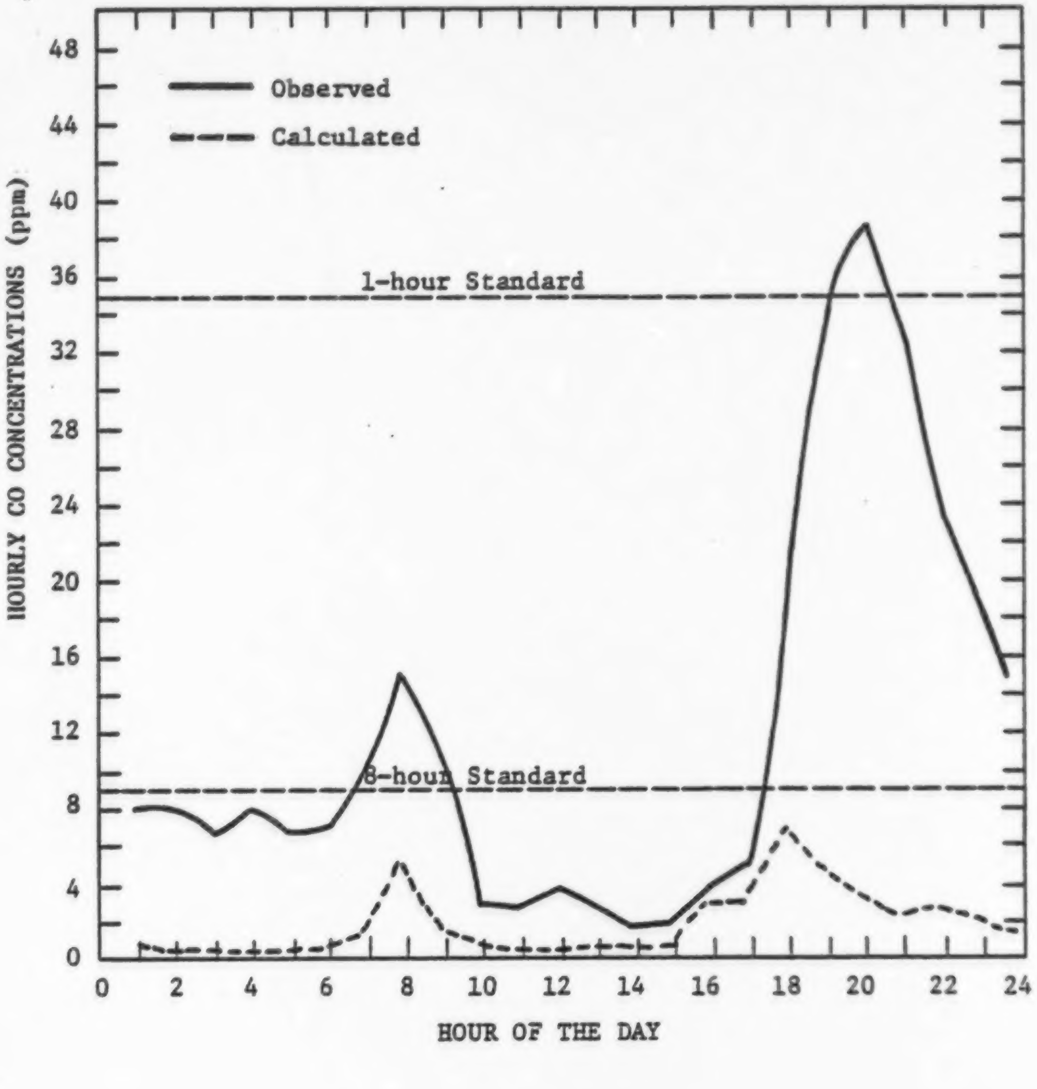


FIGURE IV-19

CALCULATED AND OBSERVED
CARBON MONOXIDE CONCENTRATION
NOVEMBER 12, 1975

INDIAN SCHOOL ROAD MONITOR

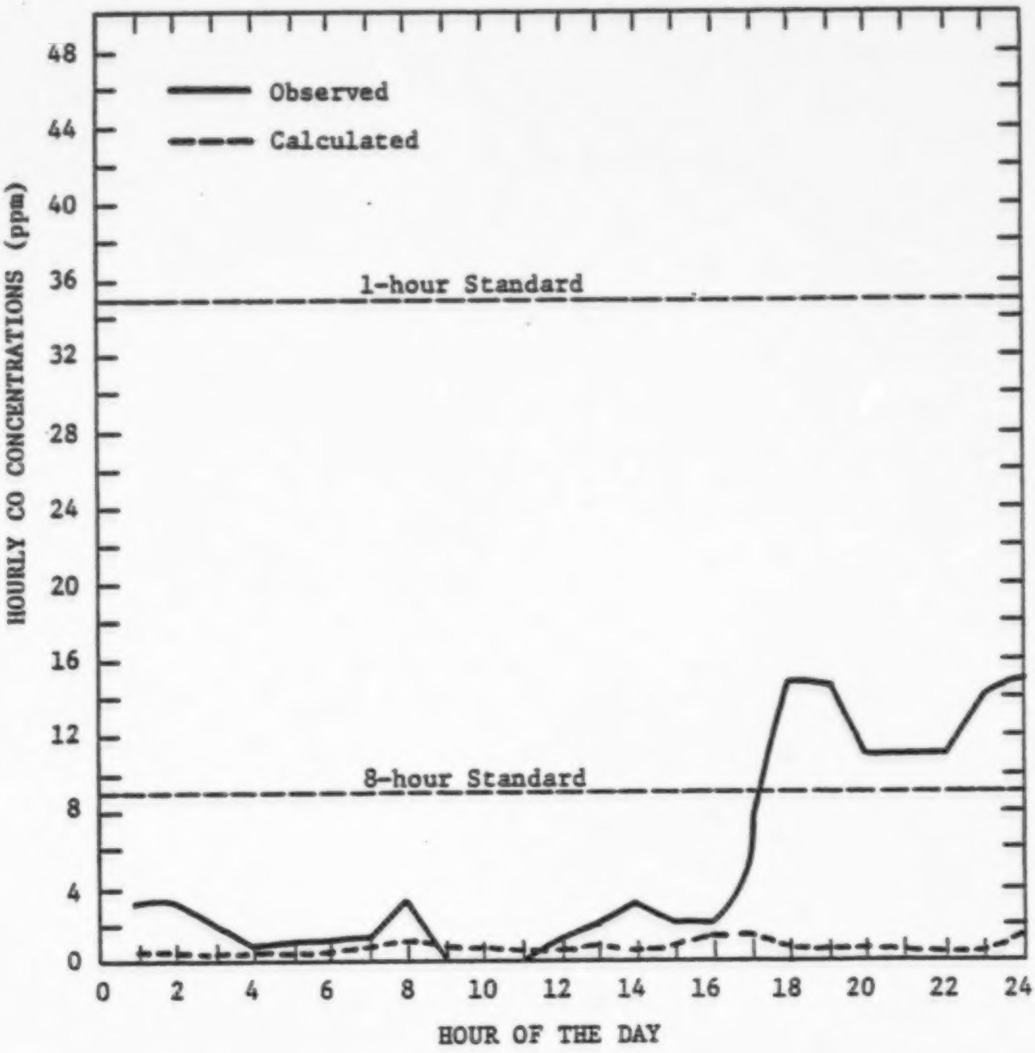


FIGURE IV-20

CALCULATED AND OBSERVED
CARBON MONOXIDE CONCENTRATION
NOVEMBER 13, 1975

INDIAN SCHOOL ROAD MONITOR

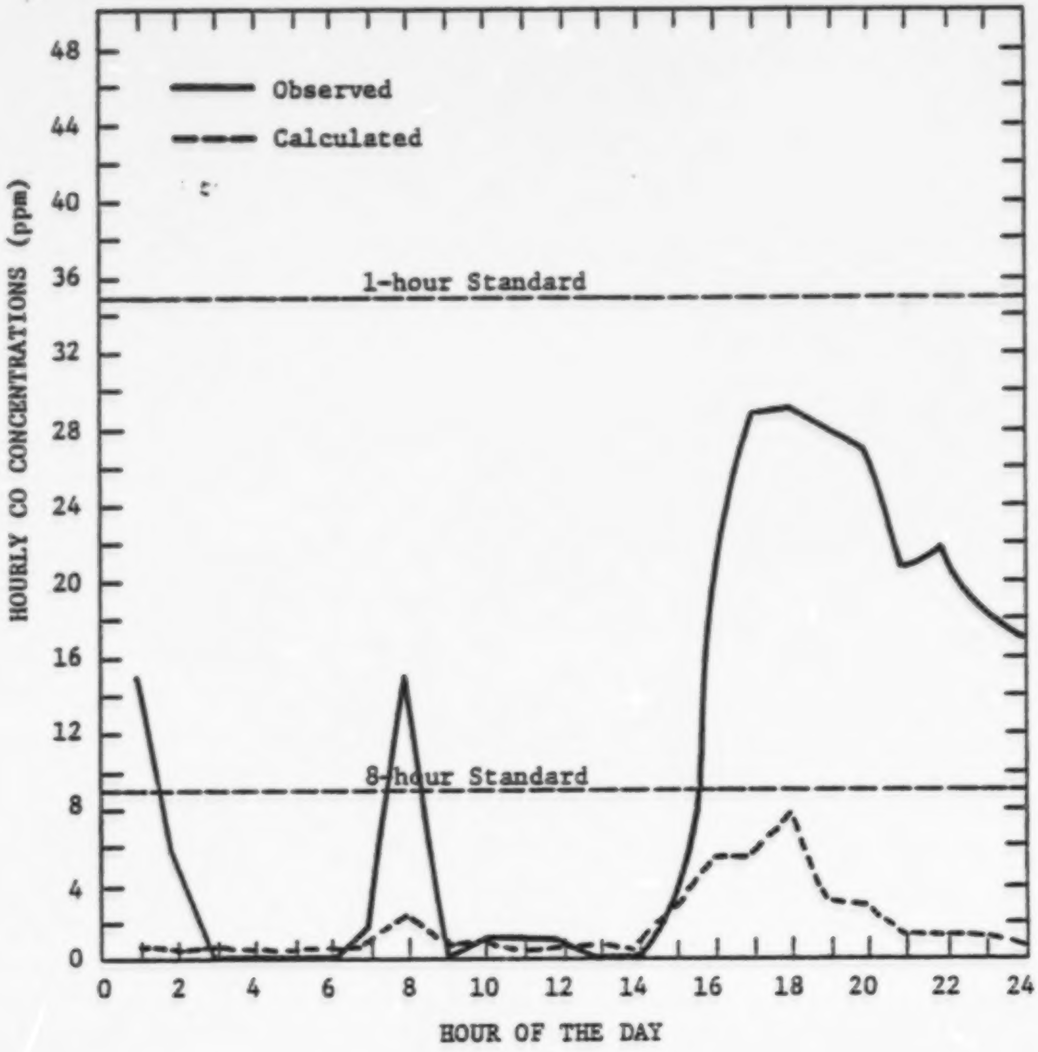


FIGURE IV-21

CALCULATED AND OBSERVED
CARBON MONOXIDE CONCENTRATION
NOVEMBER 14, 1975

INDIAN SCHOOL ROAD MONITOR

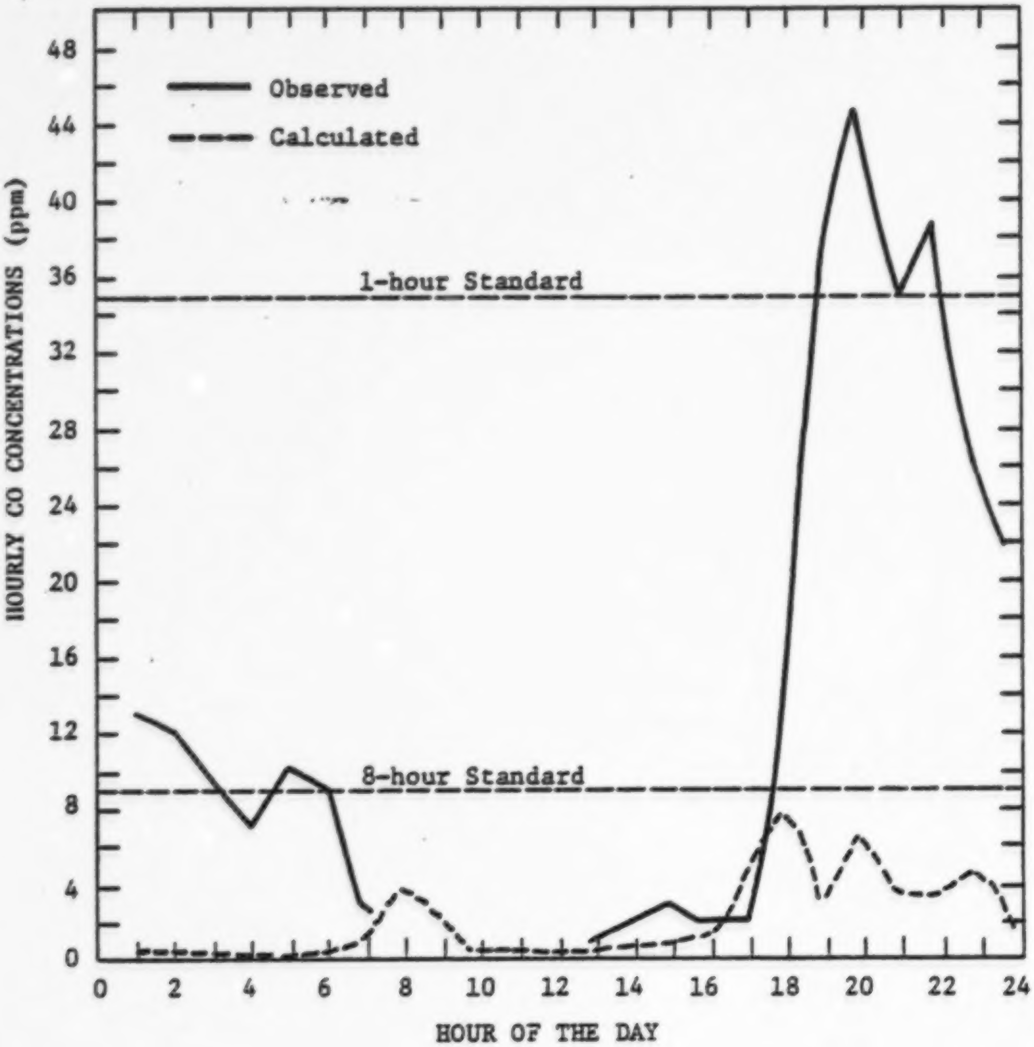


FIGURE IV-22

CALCULATED AND OBSERVED
CARBON MONOXIDE CONCENTRATION
NOVEMBER 15, 1975

INDIAN SCHOOL ROAD MONITOR

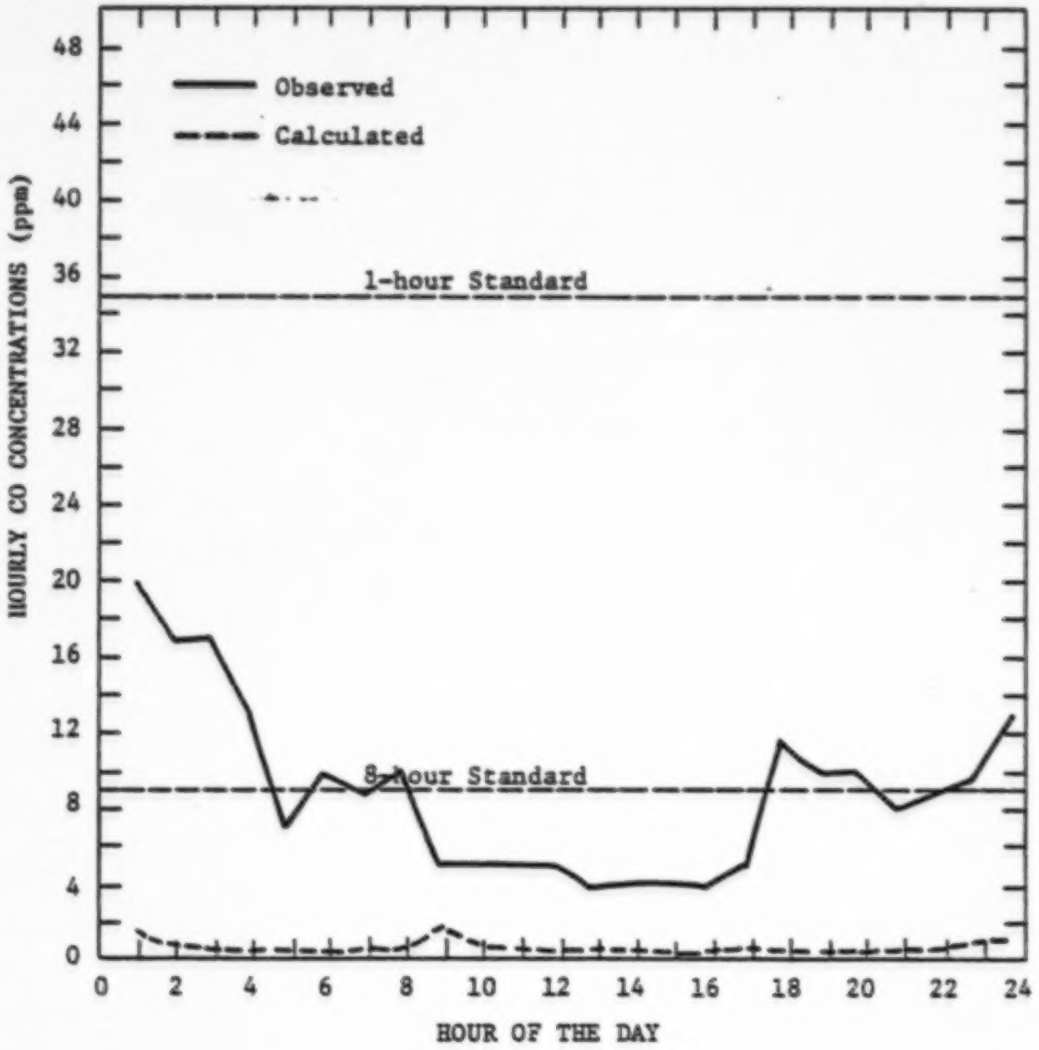


TABLE IV-2

SUMMARY OF CARBON MONOXIDE CONCENTRATIONS IN DONA ANA COUNTY - 1975, STATION 6B, LAS CRUCES

MONTH	NO. OF HOURLY READINGS	AVERAGE	MAX. ONE-HOUR
January	727	2	12
February	649	2	12
March	693	1	12
April	608	2	8
May	672	2	12
June	385	3	6
July	367	3	6
August	362	2	10
September	675	2	12
October	35	2	6
November	0	-	-
December	0	-	-

Note: The NAAQS for one hour is 35 ppm.

concentration was 12 ppm, well under the one-hour NAAQS of 35 ppm. There were no reported eight-hour averages above the NAAQS.

Station No. 6M is located at a fire station in Las Cruces. It is approximately thirty feet west of the median of Chaparro and seventy-five feet north of the median of Foster. The inlet height is approximately thirteen feet. The data were definitely influenced by the nearby intersection and the interpretation should only be in regards to one-hour concentrations, not eight-hour. Table IV-3 lists the average and the maximum hourly concentration for each month. The maximum one-hour concentration was 20 ppm, well under the NAAQS of 35 ppm. There were eleven eight-hour averages reported over the NAAQS of 9 ppm, the highest was 11 ppm.

Station No. 6V is located at the intersection of Picacho Avenue and Main Street in Las Cruces. It is approximately seventy-five feet north of the median of Picacho and seventy-five feet east of the median of Main Street and is seventeen feet above street level. This location should be interpreted to represent one-hour exposures but not eight-hour exposures. Table IV-4 lists the summary of CO concentrations for Station 6V. As shown, the maximum one-hour value reported was 13 ppm. There were no eight-hour concentrations reported to be over the NAAQS.

Station No. 6W is located on top of the Howard Johnson's Hotel in Las Cruces. It is in the middle of one of the busiest intersections in Dona Ana County. Interstate 10, University Avenue, Valley Drive, and Main Street intersect each other and completely surround this monitor. Since it is located on top of a large motel and restaurant, the data is also influenced by the frequent traffic associated with the parking lot which surrounds the site. The data collected at this site may only be interpreted as peak CO related to the nearby traffic corridors. Table IV-5 summarizes the data collected in 1975. The maximum hourly concentration was 17 ppm which is well below the NAAQS of 35 ppm. The highest eight-hour concentration reported was 10 ppm.

TABLE IV-3

SUMMARY OF CARBON MONOXIDE CONCENTRATIONS IN DONA ANA COUNTY-1975, STATION 6M, LAS CRUCES

MONTH	NO. OF HOURLY READINGS	CO CONCENTRATION (ppm) AVERAGE	MAX. ONE-HOUR
January	678	5	20
February	654	4	20
March	736	2	16
April	648	2	12
May	125	2	10
June	0	-	-
July	0	-	-
August	0	-	-
September	341	4	15
October	587	3	20
November	0	-	-
December	0	-	-

Note: The NAAQS for one hour is 35 ppm.

TABLE IV-4

SUMMARY OF CARBON MONOXIDE CONCENTRATIONS IN DONA ANA COUNTY-1975, STATION 6V, LAS CRUCES

MONTH	NO. OF HOURLY READINGS	CO CONCENTRATION (ppm) AVERAGE	MAX. ONE-HOUR
January	0	-	-
February	0	-	-
March	0	-	-
April	0	-	-
May	0	-	-
June	0	-	-
July	0	-	-
August	0	-	-
September	0	-	-
October	404	4	11
November	582	3	13
December	616	2	12

Note: The NAAQS for one hour is 35 ppm.

TABLE IV-5

SUMMARY OF CARBON MONOXIDE CONCENTRATIONS IN DONA ANA COUNTY-1975, STATION 6W, LAS CRUCES

MONTH	NO. OF HOURLY READINGS	CO CONCENTRATION (ppm) AVERAGE	CO CONCENTRATION (ppm) MAX. ONE-HOUR
January	0	-	-
February	0	-	-
March	0	-	-
April	0	-	-
May	0	-	-
June	0	-	-
July	0	-	-
August	0	-	-
September	0	-	-
October	0	-	-
November	512	2	14
December	709	2	17

Note: The NAAQS for one hour is 35 ppm.

The APRAC-1A was used to estimate a "worst-case" hourly CO concentration at the Las Cruces monitor located at Howard Johnson's (Station 6W). The meteorology data were input as a mixing depth of 90 meters, stability class 5 and a wind speed of 1 meter per second. By selecting the "worst-case" wind direction, the APRAC-1A estimated the maximum hourly CO concentration to be 12 ppm with the hourly traffic flow along all streets at 15 percent of the total daily traffic flow.

SANTA FE COUNTY

During 1975, there was one station monitoring CO in Santa Fe County. Station No. 3Q was located near downtown Santa Fe at the intersection of two main traffic corridors. It was approximately 500 feet south of the intersection of Paseo de Peralta and Cerrillos and approximately thirty feet west of the median of Cerrillos. The inlet is approximately eighteen feet above the sidewalk. This station is influenced by the heavy traffic along the two corridors. The data may not represent exposures of more than a few minutes.

Table IV-6 summarizes the data collected during 1975. The maximum one-hour concentration was 30 ppm and would appear to approach the one-hour NAAQS of 35 ppm. There were 31 reported eight-hour average concentrations over the NAAQS of 9 ppm; the highest reported was 18 ppm. However, these data should be interpreted with caution as related to population exposure.

The APRAC-1A was used to calculate the maximum one-hour CO concentration under "worst-case" meteorology and peak traffic flow as discussed in the previous section. The maximum one-hour CO concentration was calculated to be 12 ppm.

TABLE IV-6

SUMMARY OF CARBON MONOXIDE CONCENTRATIONS IN SANTA FE COUNTY-1975, STATION 3Q, SANTA FE

MONTH	NO. OF HOURLY READINGS	CO CONCENTRATION (ppm) AVERAGE	CO CONCENTRATION (ppm) MAX. ONE-HOUR
January	539	5	30
February	647	4	30
March	684	4	30
April	665	3	24
May	687	3	16
June	345	2	12
July	624	4	22
August	0	-	-
September	408	3	17
October	0	-	-
November	470	3	16
December	318	4	28

Note: The NAAQS for one hour is 35 ppm.

SAN JUAN COUNTY

During 1975, only two months of CO data were collected in San Juan County. The station was located as near to a major intersection of two main traffic corridors as possible without being directly on the street. The inlet was just above the south curb of Main Street at the intersection of Vine Avenue. The comparison of the CO levels at this site to the one-hour standard is questionable. However, Table IV-7 summarizes the two months of data. The maximum one-hour value was reported to be 20 ppm well under the NAAQS of 35 ppm. There were no eight-hour concentrations reported to be over the NAAQS.

The APRAC-1A calculated a maximum of 32 ppm at this station under worst-case meteorology and peak traffic.

TABLE IV-7

SUMMARY OF CARBON MONOXIDE CONCENTRATIONS

IN SAN JUAN COUNTY-1975, STATION 1V, FARMINGTON

MONTH	NO. OF HOURLY READINGS	CO CONCENTRATION (ppm) AVERAGE	CO CONCENTRATION (ppm) MAX. ONE-HOUR
January	621	5	20
February	224	5	20
March	0	-	-
April	0	-	-
May	0	-	-
June	0	-	-
July	0	-	-
August	0	-	-
September	0	-	-
October	0	-	-
November	0	-	-
December	0	-	-

Note: The NAAQS for one hour is 35 ppm.

CHAVES COUNTY

During 1975, there was one monitor collecting CO data in Chaves County, but it was located at two different sites. From January through August, it was located in downtown Roswell in a mobile trailer, parked in a parking space on Main Street. The inlet was approximately ten feet above street level. The data may be interpreted to represent only the street canyon of Main Street not the general air quality. During the remainder of the year, the monitor was located a few hundred feet north of its first location but its inlet was changed to the top of a building and was approximately fifty feet above street level and outside of the street canyon. The second location was approximately sixty feet east of the median of Main Street and approximately thirty-five feet south of the median of east Fourth Avenue. Table IV-8 summarizes the data collected at the two locations. The highest hourly value reported at the street level was 30 ppm, very near the NAAQS of 35 ppm. However, the highest one-hour value reported at the top of the building was 26 ppm. It should be noted that the winter months typically result in much higher CO values than the summer months. With that in mind, a significant difference in CO concentration can be noticed with a small change in the monitor's location. A dramatic decrease is noticed in the number of reported violations of the eight-hour NAAQS. While at the street level in 1975, there were 54 reported violations of the eight-hour NAAQS. But when moved to the top of a building along the same street, there were no reported eight-hour violations. This simple shift in location and the associated change in reported CO levels demonstrates the degree of caution necessary when interpreting CO data.

The street canyon model of the APRAC-1A was used to calculate the maximum one-hour CO concentrations in downtown Roswell at the two monitors. Hypothetical "worst-case" meteorology and peak traffic flow was assumed. The maximum estimated one-hour CO value was 52 ppm for the street canyon and 14 ppm for the top of the building.

TABLE IV-8

SUMMARY OF CARBON MONOXIDE CONCENTRATIONS
IN CHAVES COUNTY-1975, STATION 5ZF AND 5ZG, ROSWELL

MONTH	NO. OF HOURLY READINGS	CO CONCENTRATION (ppm) AVERAGE	CO CONCENTRATION (ppm) MAX. ONE-HOUR
January (5ZF)	0	-	-
February (5ZF)	12	10	17
March (5ZF)	637	6	22
April (5ZF)	576	6	30
May (5ZF)	700	6	28
June (5ZF)	56	6	16
July (5ZF)	0	-	-
August (5ZF)	147	9	20
September (5ZG)	0	-	-
October (5ZG)	79	6	26
November (5ZG)	397	2	25
December (5ZG)	407	2	18

Note: The NAAQS for one hour is 35 ppm.